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Comprehensive Long-Term Environmental Action Navy (CLEAN)
Contract No N62742 94 D-0048
Contract Task Order No 0030

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Camp Covington

Draft Work Plan

Abbreviated Remedial Investigation

New Apra Heights Disposal Area
COMNAVMARIANAS, Guam

Prepared for

Department of the Navy
Commander Pacific Division
Naval Facilities Engineering Command
Pearl Harbor Hawaii 96860 7300

Prepared by

Earth Tech, Inc
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Honolulu, Hawaii 96813

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CONTENTS

FIGURES

TABLES

ACRONYMS AND ABBREVIATIONS

ARARS	applicable or relevant and appropriate regulations
BCP	BRAC Cleanup Plan
BCQ	Bachelor Civilian Quarters
bgs	below ground surface
BRAC	Base Realignment and Closure
CEM	conceptual evaluation model
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
CLEAN	Comprehensive Long Term Environmental Action Navy
COMNAVMARIANAS	Commander U S Naval Forces Marianas
CPEC	contaminant of potential ecological concern
CTO	contract task order
DoD	Department of Defense
DQO	data quality objectives
Earth Tech	Earth Tech Inc
EBS	environmental baseline survey
EIA	Environmental Impact Assessment
EPA	Environmental Protection Agency
ERA	ecological risk assessment
ERAGS	Ecological Risk Assessment Guidance for Superfund
FSP	Field Sampling Plan
GOVGUAM	Government of Guam
GP	government property
HRA	human health risk assessment
IDW	investigation derived waste
IEUBK	Integrated Exposure Uptake Biokinetic Model
IR	Installation Restoration
mg/kg	milligram per kilogram
NAVACTS	Naval Activities
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NFRAP	No Further Response Action Planned
NOAA	National Oceanic and Atmospheric Administration
NOAEL	no-observed adverse effect level
Ogden	Ogden Environmental and Energy Services Co Inc
PACNAVFACENGCOM	Pacific Division Naval Facilities Engineering Command
PAH	polynuclear aromatic hydrocarbon
PBEC	Pacific Basin Environmental Consultants Inc
PCB	polychlorinated biphenyl
POI	point of interest
PRE	preliminary risk assessment
PRG	preliminary remediation goals

PWC	Public Works Center
RAGS	Risk Assessment Guidance for Superfund
RCRA	Resource Conservation and Recovery Act
RDBMS	relational database management system
RI	Remedial Investigation
RME	reasonable maximum exposure
RPM/NTR	Remedial Project Manager/Navy Technical Representative
SARA	Superfund Amendments and Reauthorization Act
SHS	Southern High School
SI	Site Investigation
SMDP	scientific/management decision point
SOP	standard operating procedure
SVOC	semi volatile organic compounds
TBC	to be considered
TAL	target analyte list
TPH	total petroleum hydrocarbon
TQ	toxicity quotients
TRVs	toxicity reference values
µg/kg	micrograms per kilogram
USDA	United States Department of Agriculture
USFWS	U S Fish and Wildlife Service
VOC	volatile organic compound
WP	work plan

1 INTRODUCTION

This document is the Work Plan (WP) for the abbreviated remedial investigation (RI) at the New Apra Heights Disposal Area on Guam (see Figure 1 1) The New Apra Heights Disposal Area will be referred to as the Site The WP was prepared for the Pacific Division Naval Facilities Engineering Command (PACNAVFACENGCOM) under the Comprehensive Long Term Environmental Action Navy (CLEAN II) Program contract no N62742 94 D 0048 contract task order (CTO) No 0030

The sampling procedures protocols and the quality assurance project plan for the RI are contained in the *Sampling and Analysis Plan Abbreviated Remedial Investigation New Apra Heights Disposal Area COMNAVMARIANAS Guam* (Earth Tech 1998b)

- Safe work practices and emergency response procedures are described in the Health and Safety Plan (Earth Tech 1998b Appendix)

The standard operating procedures (SOPs) applicable to the RI appear in *Project Procedures Manual U S Navy PACNAVFACENGCOM Installation Restoration Program (IRP)* (DON 1996)

1 1 PROJECT HISTORY

Environmental Impact Assessment (PBEC 1993) An Environmental Impact Assessment (EIA) examined the probable impacts on upland and wetland habitat and fauna of building and operating the Southern High School (SHS) located east of the Site In the higher elevations archaeologists found small amounts of modern junk including bottles car parts and other assorted metallic debris —some probably dating from the World War II era Five concrete pads were found on the upper second terrace apparently the foundations of Quonset huts or World War II housing Investigators concluded that upland and wetland habitats would likely be lost or modified and fauna displaced as a result of noise dust, and erosion (from clearing and grading) during construction of the school Plans for erosion control environmental protection and wetland mitigation were proposed to lessen possible impacts on the environment

Southern High School Site Investigation (Ogden 1995) The discovery of stained soil and buried scrap metal during construction of SHS led to a Site Investigation (SI) to assess the nature and extent of contamination Soil gas surface soil and subsurface soil samples were collected throughout the SHS site and from off site locations where excavated soil had been deposited Elevated levels of volatile organic compounds (VOCs) semi volatile organic compounds (SVOCs) total petroleum hydrocarbons (TPH) polynuclear aromatic hydrocarbons (PAHs) metals and explosive residues were detected in a pile of scrap metal and in a 26 foot high mound of soil created during construction Buried subsurface metal debris was observed extending onto the New Apra Heights parcel A geophysical survey of the SHS site found buried debris extending across the access road to the Building 4175 parcel

A human health risk assessment determined that the soil within the scrap pile and soil mound constituted a potential threat to public health other areas did not warrant concern The SI report recommended removing the contaminated soil mound and pile of scrap metal The SI report also recommended a thorough review of historical records to ensure no other contaminated areas exist onsite

Environmental Baselıne Survey (Ogden 1996b) An Environmental Baselıne Survey (EBS) of U S Navy property on Guam documented environmental conditions at the New Apra Heights and the Building 4175 parcels Surveyors classified the environmental condition of the Building 4175 parcel and a 100-foot wide strip of the New Apra Heights parcel as Category 7 i e unevaluated or requiring additional evaluation because of the potential for migration of contaminants from the SHS complex The EBS was conducted as a result of the findings in the Base Realignment and Closure (BRAC) Cleanup Plan (BCP) The BCP stated that the New Apra Heights referred to as Point of Interest (POI) 07 posed a potential threat to the SHS and adjacent property (Ogden 1996a)

Geophysical Survey (Earth Tech 1997) A non intrusive geophysical survey of the Site confirmed the presence of subsurface debris in an oval shaped area at least 480 000 square feet (11 acres) in size The results of the geophysical survey are shown in Figure 1 2 The report recommended a biological reconnaissance survey to identify ecological receptors at risk from future intrusive activities and Site contaminants trenching to visually identify subsurface debris and soil sampling to assess the nature and extent of contamination

Biological Reconnaissance and Wetland Delineation (Earth Tech 1998a) A biological reconnaissance of the New Apra Heights Disposal Site identified habitat types on and adjacent to the Site surveyed migration pathways for hazardous constituents and identified possible human and ecological receptors

Major habitats include modified secondary forest (Tangantangan scrub woodland) grassland/savanna, and wetlands Five wetland areas found on the Site (see Figure 1 3) were designated wetlands A through E The wetland boundaries extend into both the modified secondary forest habitat and the savanna habitat The boundaries were delineated by wetland biologists and the jurisdictional boundaries were surveyed by a licensed surveyor The surveyed boundaries were inspected and approved by the Division of Aquatic Water Resources Plant and animal communities including endangered species are discussed further in Section 2 1

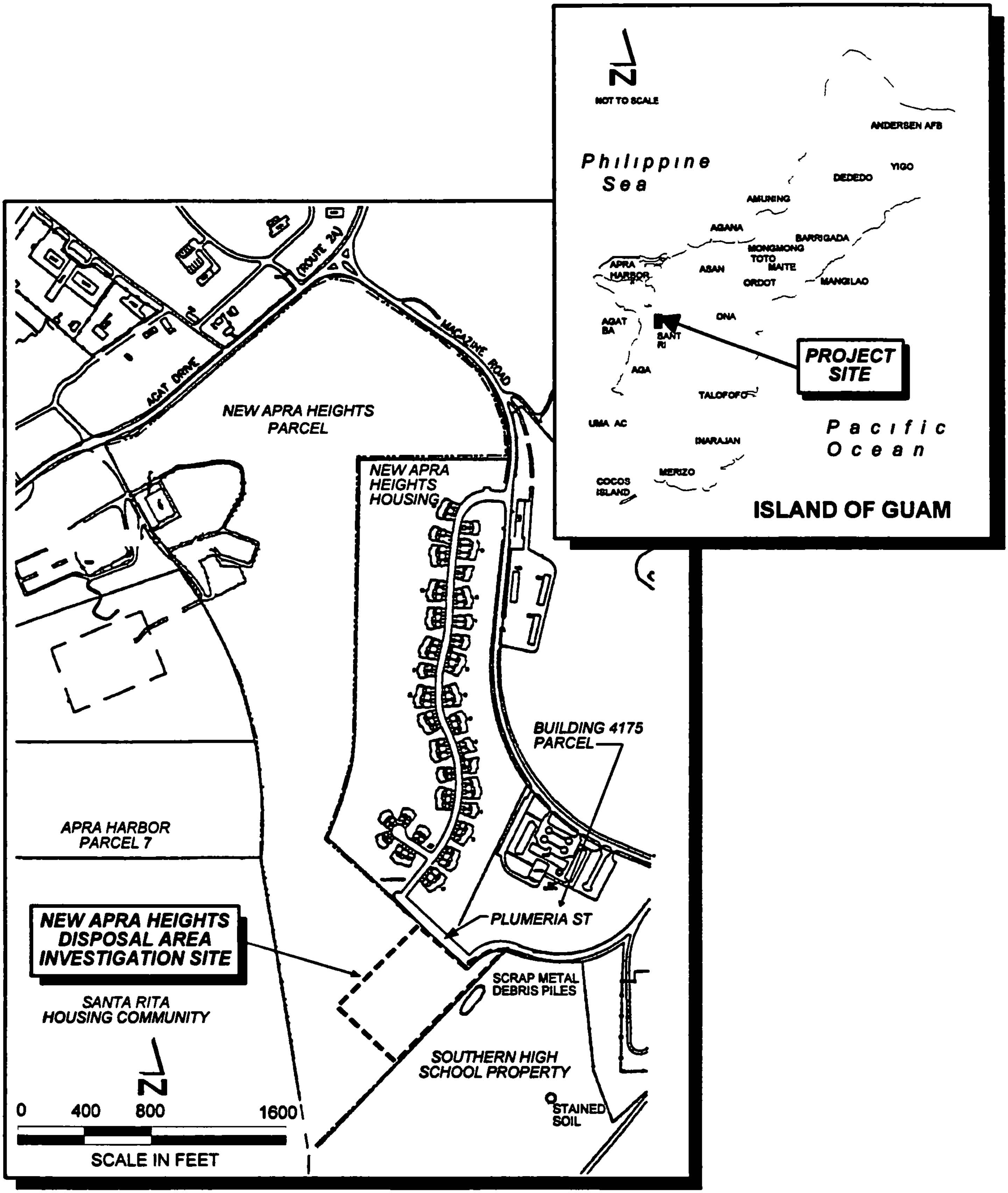
Potential pathways for migration of hazardous constituents include surface soil erosion surface water flow and leaching into the groundwater Because of the damp climate and thick vegetation air transportation of contaminated dust is not considered a concern

1 2 HISTORY OF THE SITE AND ADJACENT PROPERTY

From the 1940s to the 1970s a portion of the New Apra Heights parcel was part of Camp Busanda a former worker housing area for Public Works Center Guam Site use prior to the 1940s is not known

Northeast of the Site is the Building 4175 parcel A 1945 aerial photograph shows military tent camps on the parcel A 1954 aerial photograph portrays a parcel cleared of most vegetation but shows no signs of significant activity A 1964 aerial photograph shows Building 4175 the Bachelor Civilian Quarters (BCQ) under construction The BCQ is now used by DoD as an elementary and middle school

**Figure 1 1 Site Location Map
New Apra Heights Disposal Area
Guam**



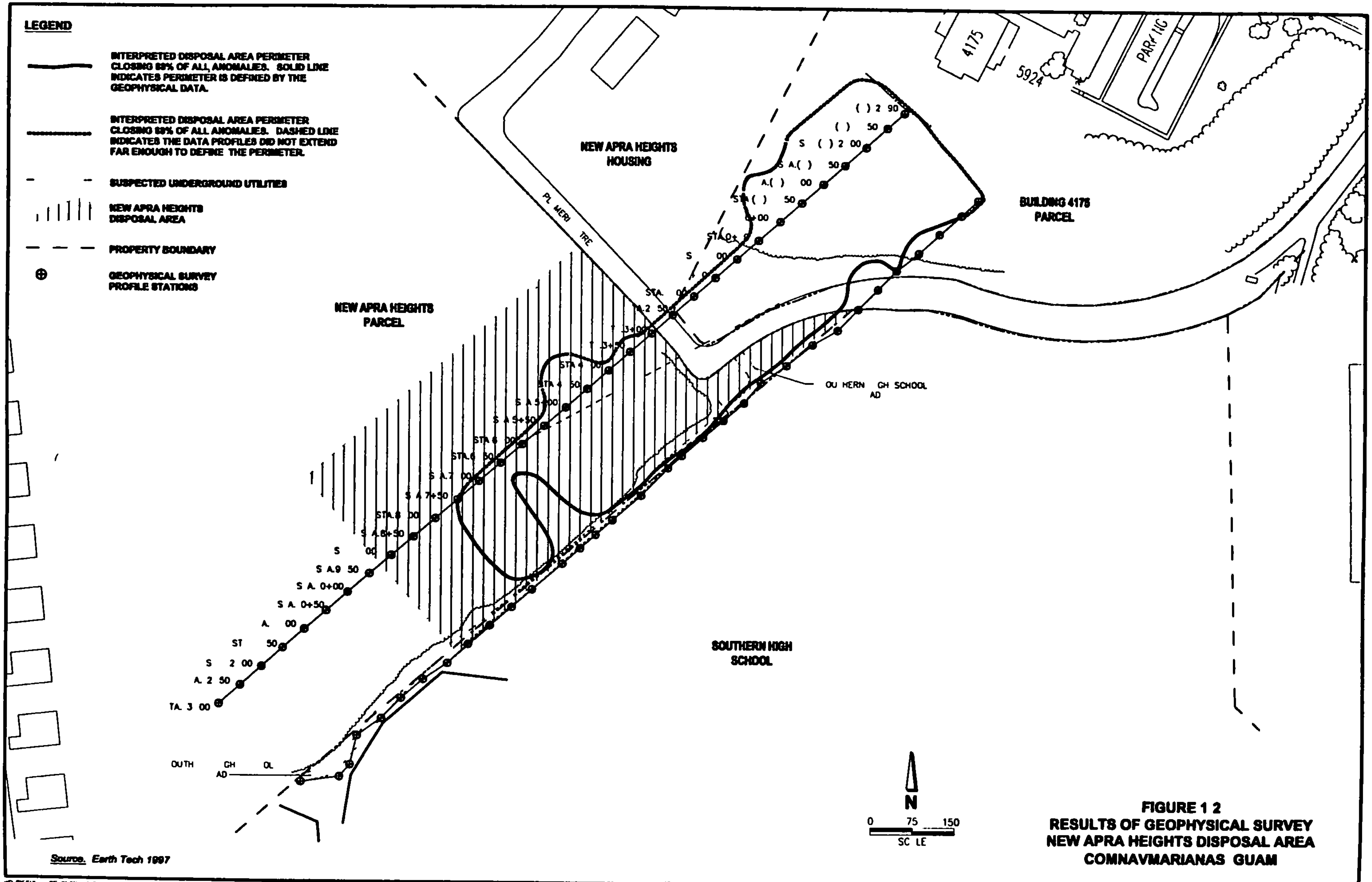


FIGURE 1 2
RESULTS OF GEOPHYSICAL SURVEY
NEW APRA HEIGHTS DISPOSAL AREA
COMNAVMARIANAS GUAM

Source. Earth Tech 1997

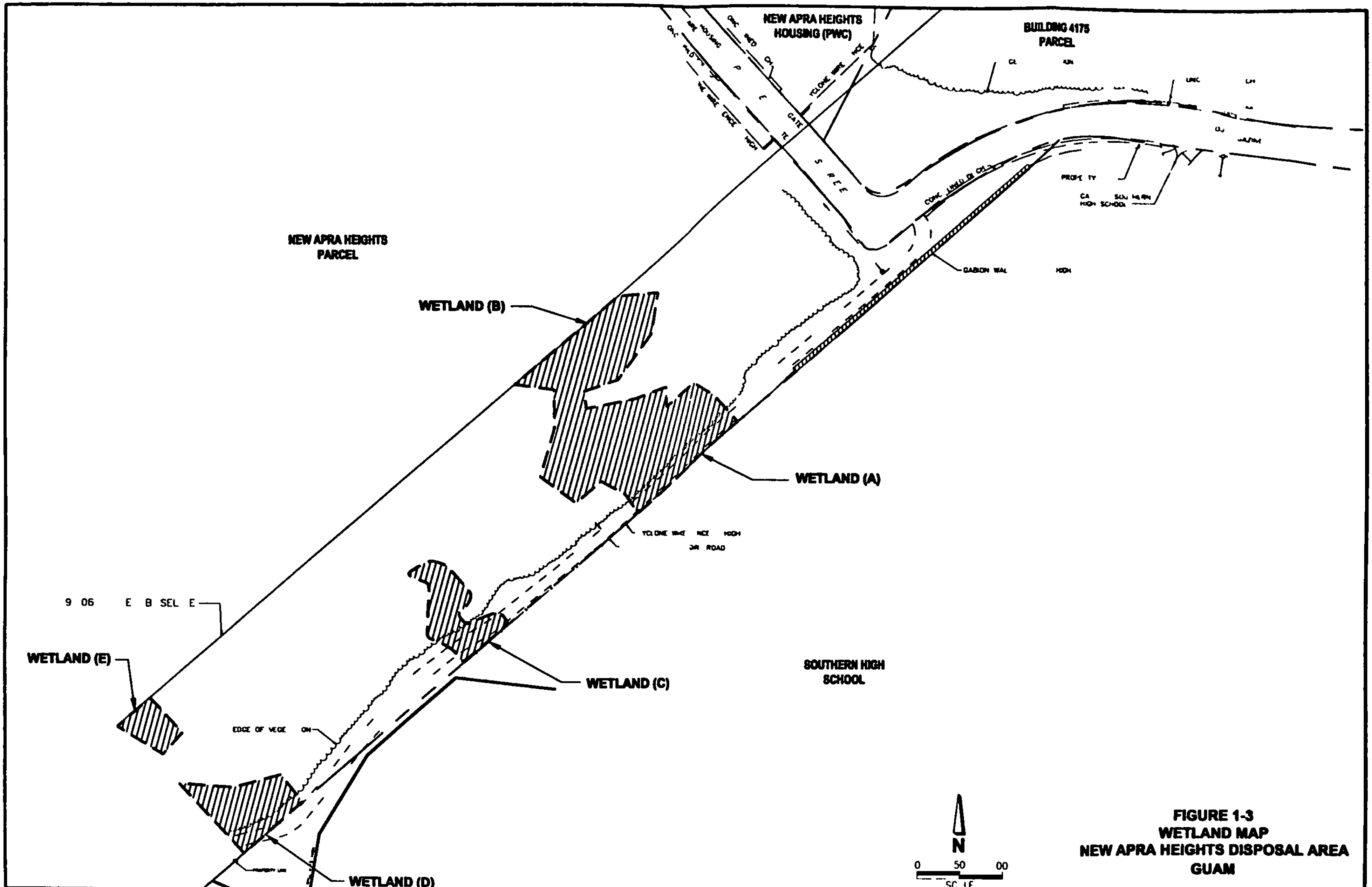


FIGURE 1-3
WETLAND MAP
NEW APRA HEIGHTS DISPOSAL AREA
GUAM

Adjacent to and south of the Site is the SHS complex, in its final stages of construction It was during this construction that subsurface debris was discovered at the complex (Ogden 1996b PBEC 1993) The property is now owned by the Government of Guam however a portion of a 15–19 foot high gabion (cobbles held together with wire mesh) retaining wall located on the SHS parcel does extend onto the Site The Government of Guam holds an easement for this portion from the Navy Historically the Site was used by the Navy s 129th Construction Battalion as a motor pool and storage yard and by the Army s 53rd Regiment as a base An Army Field Hospital may also have been located on this property The area was bulldozed for an encampment after World War II (PBEC 1993)

Improvements to the SHS infrastructure included the realignment of Plumeria Street and the construction of an access road on the New Apra Heights side of the property boundary (Figure 1 1) The gabion retaining wall and an 8 foot high cyclone wire fence delineate the boundary between the SHS complex and the New Apra Heights Disposal Area

1 3 SITE SPECIFIC OBJECTIVES

The RI has three objectives

- Determine if the Site contains levels of contamination above industrial preliminary remediation goals (PRGs)
- Characterize the nature and extent of contamination resulting from past disposal and burial practices and
- Determine the risk that contamination if detected poses to human health and the environment both onsite and offsite

1 4 PROJECT APPROACH

Metal debris possibly mixed with organic contaminants is buried at the Site A passive soil gas survey will be conducted to detect VOCs and SVOCs with relatively high vapor pressures Analytical results of this survey will be used to select soil sampling locations Trenches will be excavated to observe the characteristics of the buried debris and to sample subsurface soil Soil samples will be analyzed for VOCs SVOCs pesticides polychlorinated biphenyls (PCBs) target analyte list (TAL) metals TPH and explosives A utility survey will be conducted prior to sampling in areas that have not been surveyed See the *Sampling and Analysis Plan* (Earth Tech 1998b) for further information

2 SITE DESCRIPTION

2 1 LOCATION DEMOGRAPHY AND LAND USE

The New Apra Heights Disposal Area is situated approximately 2 miles inland of Agat Bay in the southern portion of the Island of Guam at 13 24 09 north latitude and 144 40 22 east longitude (see Figure 1 1) The Site occupies 5 3 acres (230 000 square feet) along the southeastern perimeter of the New Apra Heights subdivision Historical information and previous studies have determined that the area north of Plumeria Street is also part of the disposal area (See Figure 2 1) This RI will investigate the area south of Plumeria Street which will be referred to as the Site The Navy plans to investigate the northern portion at a later date

The Site is bordered by the following properties (see Figure 2 1)

- To the north the New Apra Heights housing operated by the Navy Public Works Center (PWC)
- To the northeast, a Navy operated elementary and intermediate school in Building 4175 The northern section of the disposal area is located on the Building 4175 parcel The building and grounds are separated from the disposal area by a 6 foot high chain link fence Surface water from the northwestern portion of the school property drains into the disposal area The Site and the portion of the disposal area located on the Building 4175 parcel are owned and operated by the Commander U S Naval Forces Marianas (COMNAVMARIANAS) Guam (formerly Naval Activities [NAVACTS])
- To the southeast, the new Southern High School (SHS) campus being developed by the Government of Guam School property is currently separated from the disposal area by a gabion wall and an 8 foot high cyclone fence
- To the southwest and northwest undeveloped land supporting natural communities of plants and animals
- To the southwest, within 1 000 feet, the Santa Rita housing community

The Site is heavily vegetated and undeveloped The southwestern third of the Site apparently was not used for waste disposal and is covered by a mixture of grassland and wetlands Areas adjacent to SHS and Plumeria Street are planted in lawn grasses maintained by mowing The Reuse Plan of the 1994 Guam Land Use Plan (GLUP) indicates future Site use will be industrial (Government of Guam 1996) A parking lot for the SHS has been considered

2 2 PHYSICAL SETTING

2 2 1 Climate

The tropical marine climate of Guam is controlled by westward moving air produced between subtropical tradewinds of the northern and southern hemispheres Weather variations are caused by continuously forming eddies or whorls in the air These disturbances are counterclockwise air flow (cyclonic) in the northern hemisphere often growing to tropical storms and typhoons On average 1 4 typhoons per year pass within 120 nautical miles of Guam There is a 1 in 5 chance that a typhoon will pass directly over Guam in a given year The likelihood of typhoons is greatest from July through September and least from January through April

Guam has two primary seasons a dry season from mid January through mid May and a rainy season from mid July through mid November Tradewinds blowing from east to northeast are the prevaılıng wınds Tradewınds are strongest durıng the dry season Guam receıves 80–110 ınches of raınfall per year Relatıve humıdıty ranges from 65–75 percent ın the afternoon to 85–100 percent at nıght with lıttle seasonal varıatıon Average annual temperature ranges between 75 and 86 degrees Fahrenheıt (F)

2 2 2 Topography

The Sıte ıs sıtuated on a volcanıc soıl and rock formatıon The volcanıc regıon generally sıtuated ın the southern portıon of the ısland ıs characterızed by rollıng to hılly uplands dıssected by numerous deep draınage poınts over a resıstant surface Further north the hılls tend to be steeper suggestıng they were ıslands ın a prehıstorıc sea The New Apra Heıghts Dısposal Area ranges ın elevatıon from 110 to 185 feet above mean sea level (Ogden 1995)

2 2 3 Soils

The soıls ın the area are fine graıned and cohesıve and are descrıbed as predomınantly clayey sılt with some sılty clay The Soıl Survey of Guam (USDA 1988) mapped three soıl types wıthın the boundarıes of New Apra Heıghts and the SHS (1) Akına sılty clay (2) Agfayan clay and (3) Akına Badland complex These soıls were derıved from the underlyıng volcanıc tuffaceous sandstones and breccıas The predomınant soıl ın the area of the Sıte ıs Akına Agfayan whıch ıs very shallow to very deep well draıned moderately steep to extremely steep on strongly dıssected mountaıns and plateaus Akına sılty clay ıs on the Terrıtory of Guam hydrıc soıl lıst because of hydrıc ınclusıons assocıated with wetlands

Soıl thıckness at the adjacent property was as much as 19 feet ın some areas Dark reddısh to green clayey sılts and sılty clays wıth mınor amounts of sandy gravel fill at the surface were ıdentıfied ın trenches at the SHS Isolated patches of lımestone gravel were also found on the adjacent SHS property and were apparently used as fill durıng prevıous gradıng These deposıts are dıscontınuous and usually less than 1 foot thıck (PBEC 1993)

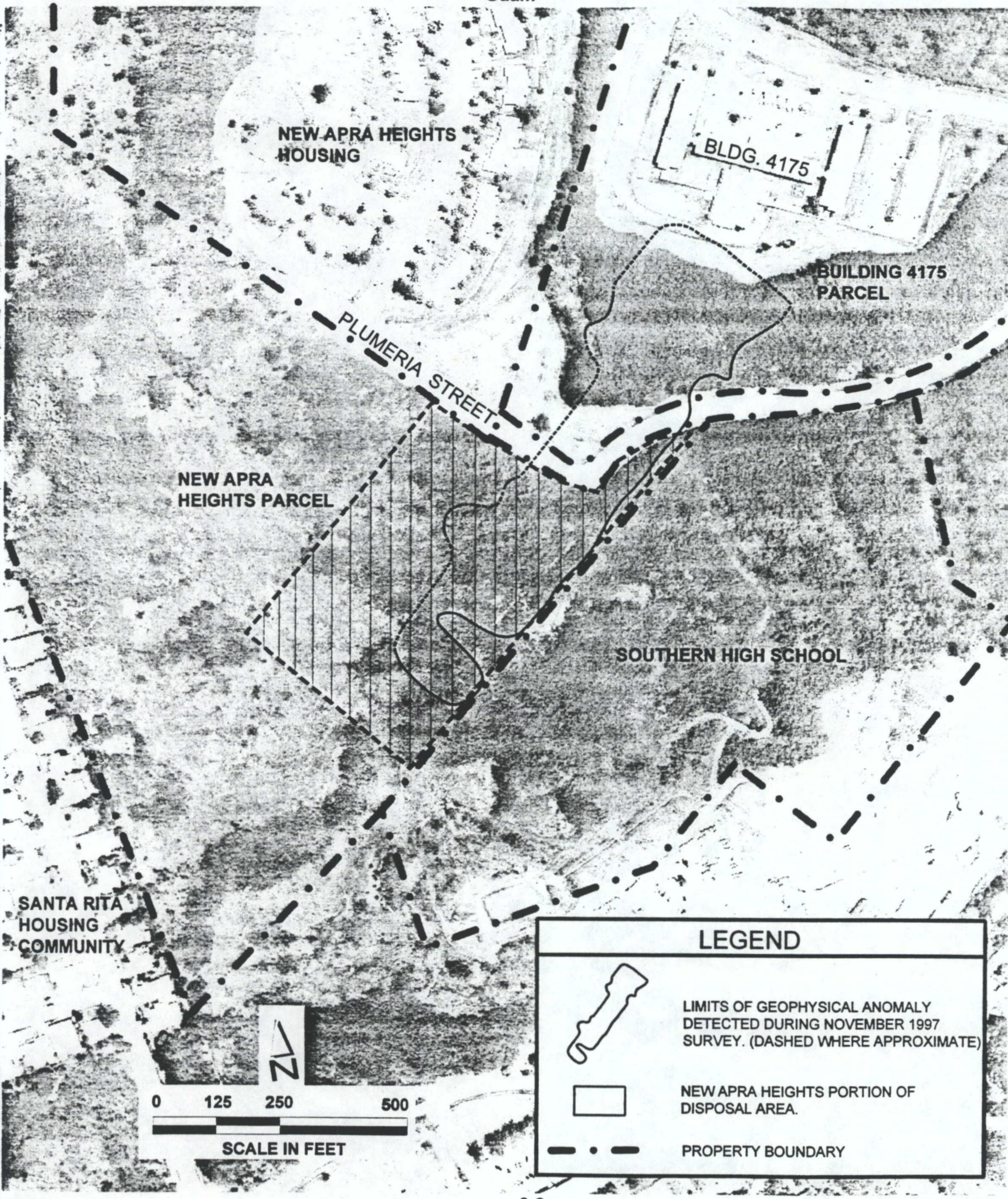
2 2 4 Geology

The ısland of Guam can be subdıvıded ınto four regıons the northern lımestone plateau ınterıor basın coastal lowlands/alluvıal valley and southern volcanıc uplands The soıl deposıts are underlaın by the Alutom formatıon consıstıng of tuffaceous shale and sandstone at depths up to about 3 feet Lenses of lımestone and lava beds also characterıze the geology of the regıon Intense foldıng and overthrustıng of volcanıc deposıts occurred before the first shallow water lımestones were deposıted Renewed faultıng followed the deposıtıon of the first lımestones creatıng the lınes of knobs rıdges and deep fissures on the ısland s surface Although mınor movements are present along the faults the faults themselves are sıgnıficant because surface water and groundwater draınages are often assocıated wıth these features A fault from central Santa Rıta to the eastern New Apra Heıghts area was mapped trendıng to the northeast of the Sıte A conjugate fault whıch ıs unmapped ıs also located east of the Sıte

2 2 5 Hydrology

The permeabılıty of the Alutom formatıon ıs generally low The rocks of the formatıon are saturated with water at varıable depths but yıeld water slowly to wells Therefore few wells have been drılled ın thıs area, and none have been developed for a permanent supply (PBEC 1993) Outcrops of the Alutom formatıon may contaın perched water ın weathered areas

Figure 2-1: Site Location and Properties Boundaries
New Apra Heights Disposal Area
Guam



Southern Guam gets most of its potable water from The Fena Reservoir owned and operated by the U S Navy (Ogden 1996b)

The Site is characterized by water bearing materials of volcanic rock and associated sediments The height of the water table in this region can range from a few feet above sea level in coastal lowlands to a few hundred feet above sea level in interior highlands Monitoring wells drilled in this subarea generally have low yields and high drawdowns Numerous springs and seeps may occur in valleys within this subarea Seepage was observed along the northeast bedrock cut face on the adjacent SHS site The Site is located near the surface drainage divide so there is little area for groundwater recharge above the Site (see Figure 2 2)

A Navy developed wetland less than 1 000 feet north of the Site is located in a different watershed The effect of the wetlands detected on the Site on the underlying groundwater is unknown Surface drainage and subsurface water flow across the Site toward the southwest and northwest from the northeast and southeast Surface drainage from the Site may enter the southeast corner of the Santa Rita subdivision Site influence on the subdivision was not investigated (Ogden 1996b)

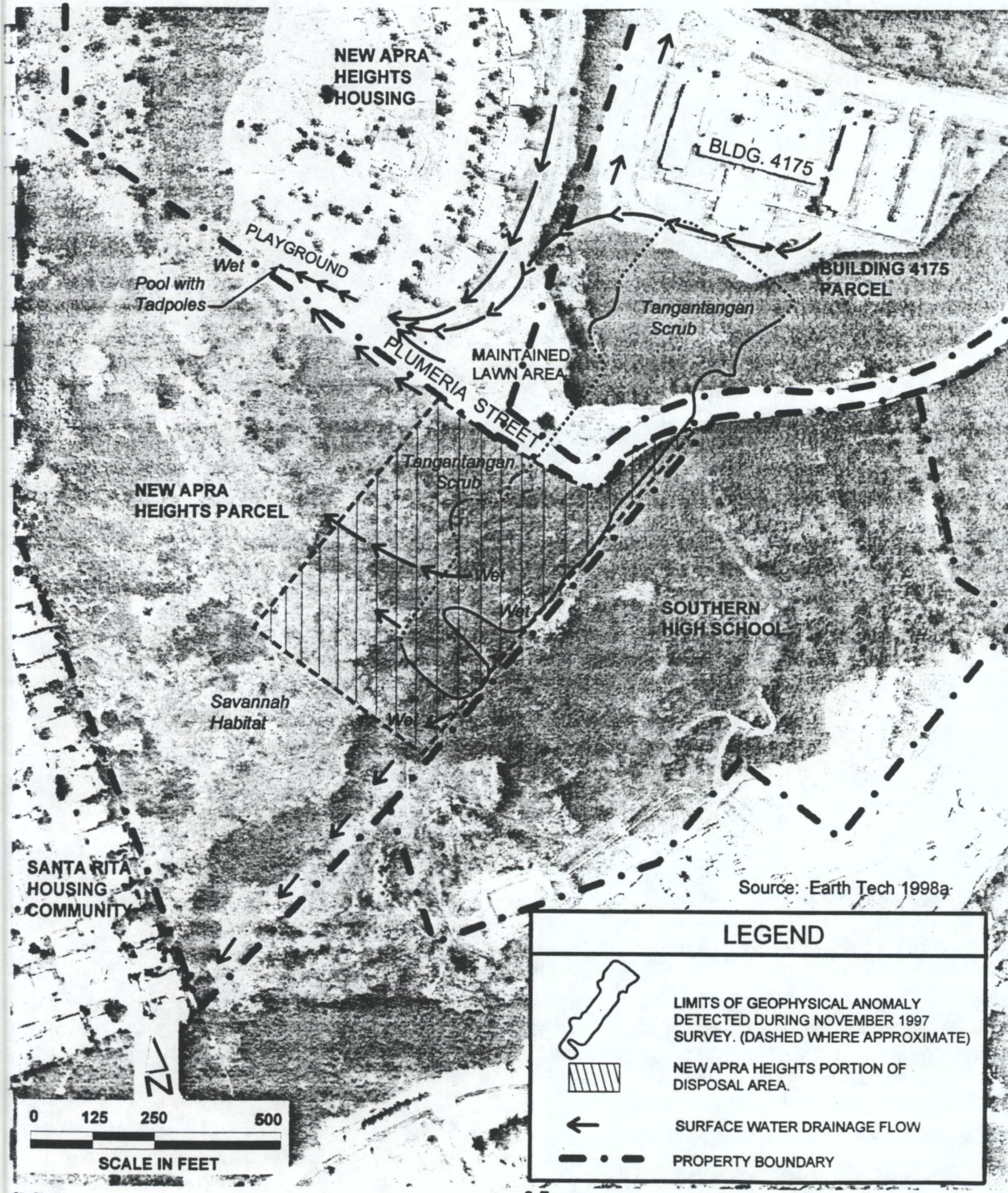
2 2 6 Vegetation

Small areas adjacent to the SHS access road and Plumeria Street are developed and covered with regularly maintained grass The southwestern third of the Site is covered by a mixture of grassland and wetlands The remainder of the Site is upland habitat mixed with small wetlands Upland habitat is dominated by modified secondary forest dominated by the tangantangan tree (*Leucaena leucocephala*) an introduced species that has invaded many vegetative communities on the island The undergrowth is thick dominated by swordgrass (*Miscanthus floridulus*) Some vegetation was cleared for the geophysical survey A list of the observed and expected flora appears in Table 2 1 (Earth Tech 1998a)

2 2 7 Endangered Species and Environments

The U S Fish and Wildlife Service (USFWS) was consulted about possible adverse impacts of geophysical survey activities on federally listed endangered or threatened species The endangered Mariana common moorhen (*Gallinula chloropus guami*) a common resident of local wetlands may occur in the vicinity of the Site The USFWS stated that the survey would not affect the moorhen or other listed species adversely (Earth Tech 1997) Before conducting the RI the USFWS will be consulted on possible impacts of RI activities A list of the observed fauna appears in Table 2 2 (Earth Tech 1998a)

**Figure 2-2: Surface Drainage
New Apra Heights Disposal Area
Guam**



Site Plan.ai

Table 2 1 Flora Observed or Expected to Occur at the Apra Heıghts Dısposal Sıte

Scıentıfic Name	Common Name	Local Name	Modıfied Secondary Forest	Savanna Communıty
Asplenıum nıdus	bırd s nest fern	Galak Dangkulo	O	—
Flagellarıa ındıca	false rattan	Bejuko Halumtano	O	—
Canavalıa megalantha	vıne	Akangkang	O	—
Leucanena leucocephala	—	Tangantangan	C	UC
Hıbıscus tılıaceus	hıbıscus tree	Pago	C	UC
Pandanus dubıus	pandanus screw pıne	Pahong	O	UC
Pandanus fragrans	pandanus screw pıne	Kafo	O	UC
Phymatodes scolopendrıa	common fern	Kahlao	C	O
Morında cıtrıfolıa	Indıan mulberry	Lada	O	O
Casuarına equısetıfolıa	ıronwood	Gago	C	O
Euphorbıa cyathophora	dwarf poınsettıa	—	UC	O
Gleıchenıa lınearıs	savanna fern	Mana	O	C
Dımerıa chlorıdıformıs	—	—	—	O
Mıscanthus florıdulus	swordgrass	Nete	C	A
Pennısetum polystachyon	foxtaıl	—	O	C
Hyptıs capıtata	button weed	Batones	O	C
Spathoglottıs plıcata	Phılıppıne ground-orchıd	—	U	O
Passıflora suberosa	wıld passıon flower	—	C	UC
Alocasıa macrorrısa	wıld taro	Pıga	UC	—
Panıcum maxımum	guınea grass	—	O	—
Phragmıtes karka	reed	Karıso	O	—
Scaevola taccada	—	Nananso	O	—
Cassytha filıformıs	—	Mayagas Agası	—	O
Cocus nucıfera	coconut palm	Nıjok	C	O
Muntıngıa calabura	Panama cherry	Mansanıta	UC	—
Sıda acuta	sıda	Esco Bılla Papago	—	UC
Sıda rhombıfolıa	sıda	Esco Bılla Dalılı	UC	UC
Walthena ındıca	walthena	Esco Bılla Sabana	UC	O
Bıdens alba	beggars tıck Guam-daısy stıckleburr	—	O	O
Saccarum spontaneum	wıld cane	—	O	O
Stachytarpheta jamaıcensıs	false verbena	—	C	—

Table 2 1 Flora Observed or Expected to Occur at the Apra Heights Disposal Site

Scientific Name	Common Name	Local Name	Modified Secondary Forest	Savanna Community
Mikania scandens	mile-a minute vine	—	O	UC
Lygodium auriculatum	savanna fern	Galak	UC	C
Lygodium scandens	lygodium	Galak	UC	O
Sporobolos elongatus	rattail dropseed	—	—	UC
Davallia solida	—	Pugua Machena	C	—
Passiflora foetida	Love in a Mist	Kinahulo Atdao	C	UC
Pancratium littorale	spider lily	Lirio	UC	—

Habitat Types S = Savanna M = Modified Secondary Forest
Relative Abundance A = Abundant C = Common
O = Occasional UC = Uncommon
NF = Not Found

Table 2 2 Fauna Observed on the Apra Heights Disposal Site

Scientific Name	Common Name	Local Name	Relative Abundance
Invertebrates			
Eisenia fetida	earthworm	Akehehá	C
Achitina fulica	African land snail	Akalehá	UC
Camaenid sp	land snail	—	UC
Cyrtophora mollucensis	tent spider	Sanyéyé	C
Amphibians			
Bufo marinus	marine toad	Tot	C
Reptiles			
Lepidodactylus lugubris	mourning gecko	Gualiek	C
Carlia fusca	four toed skink	Achiak	C
Emoia caeruleocauda	blue-tailed skink	Achiak	C
Birds			
Dicrurus macrocercus	black drongo	Salen Taiwan	UC
Ixobrychus sinensis	yellow bittern	Kakkak	UC
Passer montanus	Eurasian tree sparrow	Chichinka	UC
Streptopelia bitorquata	Philippine turtle dove	Paluman Sinisa	UC
Mammals			
Canis familiaris	feral dog	boonie dog	UC

Relative Abundance A = Abundant C = Common UC = Uncommon

3 INITIAL EVALUATION

3 1 IDENTIFICATION OF CONTAMINANT SOURCES AND TYPES AND VOLUMES OF WASTE DISPOSED

As part of an SI conducted in 1995 by Ogden soil gas and surface and subsurface soil were sampled throughout the SHS site to assess the nature and extent of contaminants encountered during construction Samples were also collected from offsite locations where soils excavated from the SHS site were deposited Samples were analyzed for TPH VOCs SVOCs chlorinated pesticides and PCBs and TAL metals

Surface soil samples contained elevated levels of TPH PAHs and metals however these contaminants were found almost exclusively within the scrap metal pile which was reportedly removed from the Site Total TPH concentrations from the scrap metal pile averaged 163 mg/kg while total TPH concentrations for the rest of the SHS site averaged 36 mg/kg PAHs were also found in all samples collected from the scrap metal pile PAHs were detected at a maximum estimated concentration of 630 μg/kg Scrap metal pile samples also contained the metals antimony arsenic cadmium lead and zinc at concentrations above the established background level for the SHS site (Ogden 1995) Subsurface soil samples were also collected from trenches located at the fuel and oil storage areas and at the southwestern corner of the SHS site Several of the trenches contained scrap metal debris including crushed 55 gallon drums Analysis of subsurface trench soil samples yielded similar results to those of surface soil samples Elevated concentrations of TPH PAHs and metals were detected in soil samples collected from near the pile Two trench soil samples yielded concentrations of TPH greater than 20 mg/kg and also contained metals PAHs were detected in only one trench soil sample

A thick yellow white substance was discovered inside a crushed 55 gallon drum that was found in a trench Analysis of this substance yielded barium cadmium and selenium at concentrations ranging from 0 02 to 0 15 mg/L Methylphenol the only organic compound detected in the substance was found at an estimated concentration of 0 15 mg/L The substance was assumed to be some sort of adhesive based on odor and visual characteristics The highest concentrations of TPH VOCs SVOCs pesticides and TAL metals were detected in soil samples collected from the 26 foot high mound Organic compounds and TPH were all found at high levels in comparison to on site and off site soil at the SHS site Minor concentrations of explosive residues were also found in soil samples collected from the SHS site The soils found to contain the highest concentrations of contaminants were darkly stained and wet with a strong odor of hydrocarbons

3 2 CONCEPTUAL EVALUATION MODEL

The conceptual evaluation model (CEM) provides a framework for assessing the condition of a site based on the relationship between sources of contamination and receptors exposed to the contamination The completeness of information in this framework aids in identifying data needs The CEM identifies contaminant sources and types (Section 3 2 1) mechanisms contaminant transport from sources (Section 3 2 2) potential human and ecological receptors of transported contaminants (Section 3 2 3) and pathways for human and ecological exposure to contaminants (Section 3 2 4)

Initial evaluation of existing data provides the following

A CEM describing contaminant transport from sources pathways for human and ecological receptor exposure to contaminants and potential receptors of transported contaminants

- A preliminary assessment of human health and ecological risk
- A summary of data needs and
- A preliminary identification of applicable or relevant and appropriate requirements (ARARs) and to-be considered material (TBCs)

The results of this initial evaluation coupled with the RI objectives outlined in Section 1 led to the development of the RI technical approach presented in Section 4

The preliminary human health and ecological risk assessment is limited to identifying potentially exposed receptors Site related contaminants pose risk to receptors if the transport and exposure pathway is complete The CEM describes the completeness or incompleteness of the exposure pathway

The physical demographic ecological and chemical information from previous investigations were evaluated to develop the CEM for the Site The CEM for the Site is a dynamic model that is revised to include or exclude sources receptors or exposure pathways as additional data become available from the RI (see Figure 3 1 and Figure 3 2)

The preliminary CEM The preliminary CEM is based on the following information Currently the Site is owned by the U S Navy and is undeveloped As shown in Figure 2 1 surrounding land uses include

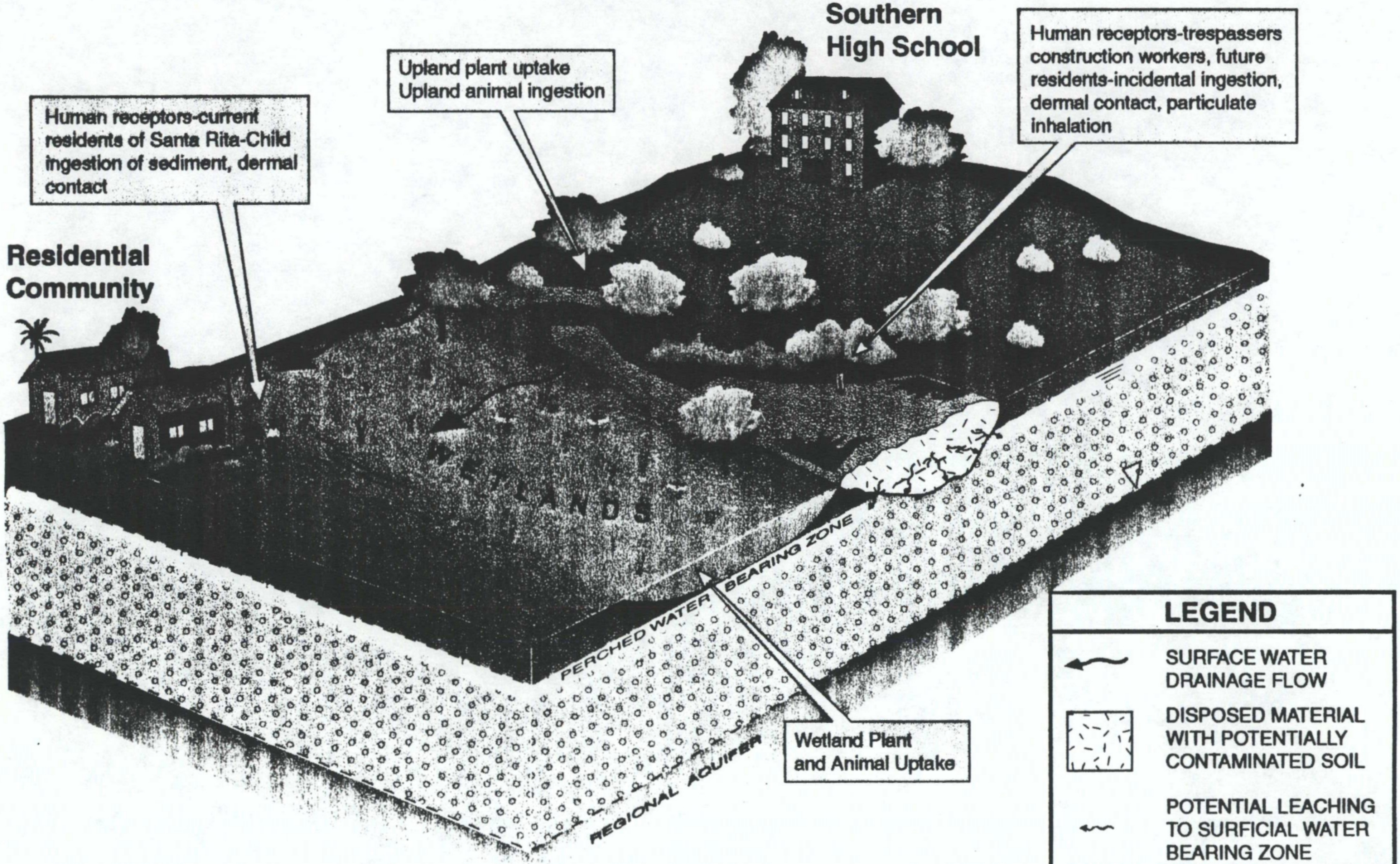
- The SHS southeast and topographically upgradient of the Site
- New Apra Heights housing
- Navy operated elementary and intermediate school in Building 4175
- Santa Rita housing development southwest and down gradient of the Site and
- Undeveloped land with wetland savanna, and Tangantangan scrub woodland habitat located southwest and downgradient (i e northwest) of the Site

The Site slopes generally from east to west Past disposal appears to have occurred primarily in the northeastern portion of the Site Based on observations made during the biological reconnaissance water drains from this portion of Site to the west and south where a mosaic of wetland and upland habitat is present The wetlands receive surface runoff of water and sediment from the disposal area Shallow groundwater from the Site may also discharge to the wetlands Part of the wetland complex drains south to the Santa Rita housing area

3 2 1 Contaminant Sources and Types

Table 3 1 lists the chemicals of potential concern (COPCs) based on Site history and the analytical results of previous investigations of the adjacent SHS site

Figure 3.1
Exposure Pathways and Receptors
New Apra Heights Disposal Area



Contaminant Source	Transport Mechanism	Exposure Route	Receptors: Current Use – Trespassers (Adult/Child)	Receptors: Current Use – Ecological Receptors	Receptors: Future Use – Onsite Residents (Adult/Child)	Receptors: Future Use – Ecological Receptors	Rationale/Data Needs
Surface Soil	Direct Contact	Dermal Absorption	Potentially Complete	Potentially Complete	Potentially Complete	Potentially Complete	Direct contact with surface soil potentially complete for current trespassers future industrial workers and ecological receptors Surface Soil data are needed to assess pathways
		Incidental Ingestion	Potentially Complete	Potentially Complete	Potentially Complete	Potentially Complete	
	Air Transport	Inhalation of VOCs	Insignificant	Insignificant	Potentially Complete	Insignificant	Air pathway insignificant for all current trespassers because of low exposure frequency and dilution Heavy vegetation prevents current fugitive dust generation so no inhalation or deposition pathway Surface soil data will provide information to assess future exposure to onsite industrial workers
		Inhalation of Particulates	Insignificant	Insignificant	Potentially Complete	Insignificant	
	Surface Water Runoff/ Discharge to Wetlands	Dermal Absorption	Insignificant	Potentially Complete	Incomplete	Potentially Complete	Surface water runoff and discharge to the wetlands is potentially complete assuming there is surficial contamination Bioaccumulation is insignificant for trespassers Surface soil data are needed to assess current and future exposure to ecological receptors
		Incidental Ingestion	Insignificant	Potentially Complete	Incomplete	Potentially Complete	
		Inhalation of VOCs	Insignificant	Insignificant	Insignificant	Insignificant	
		Bio-accumulation/ Consumption of Fish and Vegetation	Insignificant	Potentially Complete	Incomplete	Potentially Complete	

Figure 3 2 Conceptual Evaluation Model, New Apra Heights Disposal Area

Contaminant Source	Transport Mechanism	Exposure Route	Receptors: Current Use: Trespassers (Adult/Child)	Receptors: Current Use: Ecological Receptors	Receptors: Future Use: Onsite Residents (Adult/Child)	Receptors: Future Use: Ecological Receptors	Rationale/Data Needs
Subsurface Soil	Unsaturated/ Saturated Zone Transport to Groundwater and Discharge to Wetland	Dermal Absorption	Insignificant	Potentially Complete	Incomplete	Potentially Complete	Exposure to groundwater seeps by trespassing human receptors considered insignificant due to low exposure frequency and dilution/attenuation of contaminants Ecological receptors may be exposed to seepage after it discharges to surface water/sediment Groundwater underlying the site is not used for drinking water or irrigation purposes Subsurface soil data are needed to assess potentially complete exposure pathways for ecological receptors
		Incidental Ingestion	Insignificant	Potentially Complete	Incomplete	Potentially Complete	
		Inhalation of VOCs	Insignificant	Insignificant	Insignificant	Insignificant	
		Bio-accumulation/ Consumption of Fish and Vegetation	Incomplete	Potentially Complete	Incomplete	Potentially Complete	
		Drinking Water	Incomplete	Potentially Complete			

Figure 3 2 Conceptual Evaluation Model New Apra Heights Disposal Area (Continued)

G \Clean\CTO-0030\Deliver\SI\WP\Fig3- .ppt

Table 3-1 Chemicals of Potential Concern

Chemical	Range
Total Petroleum Hydrocarbons (TPH)	173–5 130 mg/kg
Volatile Organic Compounds (VOCs)	7 000–16 000J µg/L
Semi Volatile Organic Compounds (SVOCs)	6 900–270 000J µg/L
Metals	1 87–730 mg/kg
Pesticides	5 9–1 580 µg/kg
Explosives	120–160 mg/kg

Source Ogden (1995)
J Concentrations should be considered estimated because the reported value was less than the contract required quantitation limit
mg/kg = milligram per kilogram
µg/kg = microgram per kilogram

3 2 2 Contaminant Transport and Fate

After a chemical is released to the environment, it may be retained in one or more media, including the receiving medium or be transported to other media The movement or retention of contaminants is conceptually referred to as the 'transport mechanism For example contaminants released to soil may be taken up by plants or animals the uptake of contaminants is a transport mechanism for soil contaminants

The transport of contaminants creates other sources of contamination For example if contaminants in unsaturated subsurface soil migrate to groundwater in the pure phase (product) vapor phase (soil gas) or dissolved phase (leaching) then groundwater becomes a source of contamination The CEM considers these potential sources of contamination for the Site

3 2 3 Human and Ecological Receptors

Potential human receptors include trespassers Potential ecological receptors include terrestrial and wetland plants and animals Potential exposure pathways include incidental ingestion of surface soil and dermal soil contact for human and terrestrial animal receptors and food web exposure for terrestrial animals Because of the damp climate and thick vegetation at the Site air transportation of contaminated dust is not expected to be a concern Terrestrial plants could be exposed via root uptake from surface soil Wetland plants and animals could be exposed via uptake from contaminated surface water and sediment

The Site will be transferred from the Navy under the BRAC Future land use of the property will be industrial as specified in the GLUP 1994 land use plan (Government of Guam 1996) Potential future human receptors include industrial workers and trespassers The exposure pathways could include incidental ingestion of surface soil dermal soil contact, and inhalation of VOCs Future exposure pathways for ecological receptors via surface soil are similar to current pathways

3 2 4 Exposure Pathways

Exposure pathway assessment is based on (1) source and release mechanism (2) transport mechanism (3) exposure point, and (4) exposure route The CEM which considers all of these elements uses historical data and observations made during the RI the geophysical survey biological reconnaissance and wetland delineation This CEM will be updated during the RI in response to new information

Potential pathways for migration of hazardous constituents include surface soil erosion surface water flow and leaching into the groundwater Because of the damp climate and thick vegetation air transportation of contaminated dust is not considered a concern

Soil Pathway Onsite receptors may be exposed to contaminants retained in surface soil through two exposure routes dermal contact or incidental ingestion Dermal contact or incidental ingestion of surface soil requires direct contact with the surface soil on the Site Therefore offsite receptors are not exposed to contaminants retained in surface soil through dermal contact or incidental ingestion

Onsite and offsite receptors may be exposed to contaminants taken up from soil by plants/animals by ingesting the plants and/or animals Plant uptake of contaminants in soil occurs through the root zone between the ground surface and approximately 3 feet below ground surface (bgs)

Surface Water Flow Onsite receptors may be exposed to contaminants in surface water runoff through incidental ingestion and/or dermal contact However incidental ingestion of surface water is unlikely and dermal contact is infrequent and/or of short duration Therefore this exposure route is assumed to be incomplete or insignificant for onsite and offsite receptors

Groundwater Pathway The shallow water bearing zone and deeper groundwater aquifer are not used for domestic purposes All existing housing in the disposal area vicinity is served by municipal water and sewerage This water supply system is expected to be expanded to include all new development in the area Therefore there is no current, and probably no future exposure to potentially contaminated groundwater Ecological receptors are generally not exposed to groundwater unless it discharges to the surface

3 3 IDENTIFICATION OF DATA NEEDS

Limited field data have been collected within the site boundary To achieve the objectives of the RI field data are needed to

- Verify presence of potential onsite contamination sources
- Assess the nature of contamination if found onsite
- Provide a preliminary evaluation of the extent of the contamination if found onsite
- Enable preliminary evaluation of the potential human health and ecological risks posed by the Site and
- Determine if contaminants are migrating offsite

3 4 SITE SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS AND TO BE CONSIDERED MATERIALS

3 4 1 Definitions

Navy policy is that all actions carried out under the Installation Restoration program be consistent with Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (as amended by Superfund Amendments and Reauthorization Act [SARA] and the National Oil and

Hazardous Substances Pollution Contingency Plan [NCP]) in Title 40 of the Code of Federal Regulations Part 300 CERCLA requires cleanup response actions to

1 Protect human health and the environment
2 Be cost effective and
3 Comply with ARARs and TBCs

The ARARs and TBCs that govern actions at CERCLA sites fall into three categories based on the chemical contaminants site characteristics and location and proposed cleanup activity Chemical specific ARARs and TBCs establish numerical standards limiting the concentration of substances in the medium of concern or medium affected by the cleanup action Location specific ARARs and TBCs refer to restrictions placed on the concentration of substances or conduct of the cleanup action due to site location Action specific deals with technology or activity based restrictions controlling the performance and design standards of a specific cleanup action

Requirements may be applicable or relevant and appropriate Applicable requirements are federal or state standards by which Site activity (sampling cleanup etc) is regulated These requirements meet legal prerequisites that concern the circumstances and conditions at the site Applicable requirements identification will include

- Regulatory authority and the statute or regulation
- Types of activities the statute or regulation requires directs or prohibits
- Types of substances or activities falling under the authority of the requirement and
- Time period for which the statute or regulation is in effect

When requirements are not directly applicable to a site or activity they may still be appropriate and relevant Requirements are appropriate and relevant if they pertain to problems similar in nature to circumstances at the site These requirements are identified by first comparing the site circumstances and the requirements of a particular jurisdiction then determining whether the two are sufficiently similar The determination of relevant and appropriate requirements is made with some discretion Some of the factors for determination include

- Type of cleanup action
- Contaminants present
- Waste characteristics and
- Physical characteristics of the site

It is possible for only a part of a requirement to be considered relevant and appropriate

TBCs are advisory they are not mandated by government Typically TBCs are used when no ARARs exist to apply to certain situations or circumstances They may also be used to set ARARs when those ARARs are not sufficient to protect human health or the environment For cleanup activities TBCs can become standards which need to be complied with by the proposed cleanup remedy The application of TBCs is subject to discretion and is not required

Tables have been developed to outlıne and define ARARs and TBCs relevant to the Sıte The tables correspond to chemıcal specıfic (Table 3 2) locatıon specıfic (Table 3 3) and actıon specıfic (Table 3 4) ARARs

Table 3-2 Chemıcal Specific ARARs and TBCs

ARAR/TBC	Requirement Descrıptıon	Cıtatıon	Status
Health Based Guıdelınes for Soıl Based on Dırect Contact	Generıc crıterıa used to evaluate which contamınants are present ın surface soıls at concentratıons that warrant further assessment	U S Envıronmental Protection Agency (USEPA) Regıon IX PRGs second half of 1997	TBC
Human Health Rısk Assessment Levels of Concern	Human health rısk assessment-derıved concentratıons	None	TBC
Mıgratıon Guıdelınes	Soıl Screenıng Levels consist of chemical soıl concentratıons used to determıne the potentıal for mıgratıon of contamınants from soıl to groundwater	USEPA Region IX Soıl Screenıng Levels (SSLs) Second half of 1997	TBC

Table 3-3 Locatıon Specıfic ARARs and TBCs

ARAR/TBC	Requirement/ Descrıptıon	Cıtatıon	Status
Clean Water Act	Any sıte ınvestıgatıon or remedıatıon action that may ınvolve dredgıng or fillıng a wetland area requıres a permıt ıssued by the state or federal government For CERCLA sıtes permıts are not requıred but all substantıve requirements of the Act must be followed	33 USC 1251 Clean Water Act 404	ARAR
Guam Soıl Erosıon and Sedımentatıon Control Regulatıons	Provısıons ımpose requırements on earth-movıng actıvıtıes which create a danger of accelerated erosıon and which requıre plannıng and implementatıon of effectıve soıl conservatıon measures	Section I Subsection F Section XI Subsectıon A	ARAR
Preservatıon and Enhancement of Wetlands	The management and protection of wetland areas shall be taken ınto consıderatıon and ıncorporated into the decısıon makıng process whenever proposed actıons may have an ımpact upon those areas	40 CFR 6 Appendıx A	ARAR

Table 3-4 Actıon Specific ARARs and TBCs

ARAR/TBC	Requirement/Descrıptıon	Cıtatıon	Status
Resource Conservatıon and Recovery Act Hazardous Land Dısposal	Thıs requirement regulates the hazardous substances contaıned ın the IDW not the IDW ıtself The regulatıons govern how the IDW will be handled and dısposed	40 CFR Part 261	ARAR

IDW = ınvestıgatıon-derıved waste

3 4 2 Chemical Specific ARARS/TBCs

No known chemical specific ARARs dealing with soil contamination at the Site exist TBCs must be used as the guidelines or standards associated with planned activities at the Site

U S Environmental Protection Agency (USEPA) Region IX Preliminary Remediation Goals USEPA Region IX PRGs are chemical specific goals set by the USEPA as health based TBCs USEPA uses standard defaults for calculations These values include exposure frequency duration receptor sensitivity and chemical physical and toxicological characteristics of contaminants The estimates provided by the USEPA are considered conservative and are used to calculate risk of potential contamination from these compounds under site specific conditions The PRG contaminant concentrations are derived from carcinogenic or systemic toxicity when inhaled ingested or absorbed through the skin

At present, the Site is inactive There is no work being conducted at the Site and access has been restricted Therefore potential exposure due to land use is not of concern Because future land use for industrial purposes is planned by the Government of Guam (1996) the industrial PRG values shall be used as screening criteria The PRG list is a conservative estimate of potential human health risk Exposure to concentrations at or below those given in the PRG list is classified as a minimal health risk Actual cleanup concentrations may be as much as 100–1 000 times higher than PRGs

The USEPA Region IX PRG list will be used as chemical specific TBCs for surface and subsurface soils Because the federal PRGs are health based figures they are only relevant for surface soil samples and are based on direct contact by receptors

Human Health Risk Assessment A human health risk assessment (HRA) will be conducted as described in Section 5 6 if contaminants are detected Levels of concern will be calculated for contaminants dected

USEPA Soil Screening Levels (SSLs) USEPA SSLs provide values for chemical concentrations that estimate the potential for contaminant migration from soil to groundwater The SSLs are generic values calculated using default values in standardized equations They were developed using a dilution attenuation factor (DAF) to account for natural processes that reduce contaminant concentrations in the subsurface There are also generic SSLs that assume no dilution or attenuation between the source and the receptor

3 4 3 Location Specific ARARs/TBCs

Location specific ARARs and TBCs restrict soil concentration levels and activities conducted at the Site because of the Site location

Clean Water Act Section 404 Wetlands located on the Site are (Earth Tech 1998a) protected by Section 404 of the Clean Water Act (CWA) which regulates activities adversely affecting federally protected wetlands As a CERCLA site the Site is exempt from the permit requirements that normally apply to site investigations or remedial actions conducted in or around wetlands Nonetheless investigators must comply with the substantive requirements of the regulations To the extent possible no activities will be conducted to adversely impact the wetlands Some RI activities will qualify for permitting under one or more nationwide permits These activities will comply with applicable nationwide permit conditions

Guam Soil Erosion and Sedimentation Control Regulations Guam regulations were designed to protect the wetlands streams and marine waters of Guam The planned excavation work will be conducted in the proximity of two wetland areas and does present the possibility of soil erosion and sedimentation affecting the purity of the wetland areas The provisions of these regulations impose requirements on earth moving activities that can create accelerated erosion or the danger of accelerated erosion As such soil conservation measures must be effectively planned and implemented Regulations set forth requirements for the control of grading clearing and grubbing and stockpiling set limits for erosion and sedimentation establish administrative procedures and minimum requirements for issuance of permits and provide for the enforcement of such rules and regulations The purpose of the RI is considered exploratory excavations for the purpose of soils testing and therefore exempt under Section I Part F subpart f of the Guam Environmental Protection Agency regulations

Preservation and Enhancement of Wetlands (40 CFR 6 Appendix A) Wetland and flood plain management and protection goals must be incorporated into the planning regulatory and decision making processes when an activity is planned at a site where wetlands are present It also promotes the preservation and restoration of wetland and flood plain areas so their natural and beneficial values can be realized All wetland areas in the proximity of the Site will be avoided if possible

3 4 4 Action Specific ARARs/TBCs

Action specific ARARs/TBCs refer to technology or activity based requirements or regulated actions taken with respect to hazardous waste Because no remedial actions are currently planned no action specific ARARs or TBCs other than those related to investigation derived waste (IDW) have been identified If necessary action specific ARARs and TBCs will be identified prior to conducting further response activities

Management of Investigation Derived Waste IDW which may include soil decontamination fluids (water detergent water) and disposable sampling and personal protective equipment will be managed and handled according to its characteristics There are no regulations specifically pertaining to IDW but Resource Conservation and Recovery Act of 1976 (RCRA) regulations may cover the constituents within the IDW

Title 40 of the Code of Federal Regulations Part 261 establishes basic definitions of solid and hazardous waste Waste materials that may be generated from the RI will be characterized for disposal offsite

4 RI RATIONALE

4 1 APPROACH

A two-phased approach will be used to achieve the objectives of the RI as outlined in Section 1 3 During the first phase a passive soil gas survey will detect VOCs and relatively volatile SVOCs that are possibly commingled with the metal debris detected during the geophysical survey Passive soil gas samples will be taken using a triangular grid described in the SAP (Earth Tech 1998b) and in Section 4 2 below Three additional samples will be taken from the wedge shaped section northeast of the Site between Plumeria Street and the gabion wall

During the second phase surface and subsurface soil samples will be collected from predetermined locations along a triangular grid as described in the SAP (Earth Tech 1998b) One additional surface and one subsurface soil samples will be taken from the wedge shaped section northeast of the site Soil gas data will be used to adjust surface and subsurface soil sampling locations The soil samples will be analyzed for TPH VOCs SVOCs chlorinated pesticides and PCBs explosives and TAL metals

A limited number of surface soil samples (approximately five) will also be collected from low lying areas suspected to receive runoff from the Site and will be analyzed for the Site COPCs These samples will be in addition to those collected along the triangular grid Data from these samples will be used to assess the potential for contaminants to have migrated from the Site

4 2 DATA QUALITY OBJECTIVES

The overall sampling and analysis strategy presented herein was developed using the USEPA Data Quality Objectives Process (USEPA 1994) an effective structure for characterizing project resources and constraints The DQO process identifies decision makers the resources available and the purpose of the study describes how decisions will be made and refines the sampling design using inputs from the stakeholders

The U S Navy is conducting the RI in support of property transfer under the BRAC Act Previous investigations indicate that contamination may be present and that further evaluation is warranted The RI will collect soil gas surface soil and subsurface soil samples Sampling and analysis data must be gathered to determine contamination levels and human health or ecological risk The primary decision maker in this process will be the BRAC Cleanup Team (BCT) consisting of representatives from the Navy USEPA Region IX and Guam EPA

4 2 1 Statement of the Problem

Previous investigations at the SHS and the Site identified buried debris and chemical contamination TPH VOCs SVOCs pesticides and PCBs explosives and TAL metals have been detected at the SHS and are Site COPCs A geophysical study at the Site surveyed an anomaly consisting of buried debris

BRAC requires the Site to be investigated and if necessary cleaned up before the property is transferred PACNAVFACENGCOM will investigate the Site in accordance with the presidential mandate "Fast Track Cleanup at Closing Installations" to determine the nature and extent of environmental contamination resulting from past disposal and burial practices

Information required includes the identity concentration location and distribution of COPCs Results of the field investigation will be used to further refine the CEM and to perform a screening risk assessment

4 2 2 Identification of the Decision

The following decisions will be made based on the data gathered during the RI and incorporated into the RI conclusions

Do COPCs exceed ARARs or TBCs identified?

Does the Site pose an unacceptable risk to human health or the environment?

4 2 3 Identification of Inputs to the Decision

Soil gas and surface and subsurface soil samples will be collected and analyzed for the Site COPCs Summaries of proposed activities that will be conducted are included below Details of the planned activities are included in the SAP (Earth Tech 1998b)

One hundred eighteen passive soil gas samples will be collected based on a 625 foot by 400 foot triangular grid and 3 passive soil gas samples will be collected from the wedge shaped section northeast of the grid Samples will be analyzed for VOCs and SVOCs These data will be used to further refine the soil sampling plan

Twenty surface soil samples will be collected along a 500 foot by 300 foot triangular grid and analyzed for TPH VOCs SVOCs chlorinated pesticides PCBs explosive residues and TAL metals One surface soil sample will be collected from the wedge shaped section northeast of the site and analyzed for the same list of contaminants

Twenty one trenches will be excavated to characterize subsurface conditions and collect subsurface soil samples These samples will be analyzed for the same parameters as the surface soil samples Proposed trench locations will be at the same locations as the surface soil samples

Five surface soil samples will be collected from low lying areas located adjacent to the disposal area These samples will be analyzed for the same parameters as the other surface and trench soil samples Results from the analysis of these samples will be used to assess the potential for offsite contaminant migration

Other decision making inputs are as follows

Identity and concentrations of environmentally significant contaminants at adjacent sites either through knowledge of historic use or identification in previous Site samples

Characterization of the concentrations of naturally occurring analytes in background locations based on previous environmental investigations and soil survey data (USDA 1988)

4 2 4 Definition of Study Boundaries

This RI addresses only the portion of the disposal area located within the New Apra Heights parcel (i e the area southwest of Plumeria Street and northwest of the gabion wall) The portion of the disposal area located on the Buildıng 4175 parcel (north of Plumerıa Street) wıll be addressed by the Navy ın a separate study

Surface soıl samples wıll be collected from the first 6 ınches of the soıl One subsurface soıl sample wıll be collected from each excavated trench at depths dependent on the dıstrıbutıon of burıed debrıs The horızontal and vertıcal lımıts of the Sıte wıll be dependent on the depth of debrıs and extent of contamınatıon The lımıts of the study wıll be expanded ıf necessary to assess contamınatıon detected durıng the RI

Due to Guam s remote locatıon the dıfficulty of transportıng samples may cause analytıcal sample holdıng tımes to be exceeded Specıal care wıll be taken to properly contaınerıze and shıp the samples

Guam has two prımary seasons dry and raıny Probably the most unbıased samples can be obtaıned between the end of May and the mıddle of July durıng the transıtıon perıod and before the start of the raıny season The tıme frame for the RI field ınvestıgatıon approxımately June 1998 to July 1998 coıncıdes wıth thıs tıme frame

4 2 5 Summary of Decısıon Rules

Decısıon makıng wıll be based on valıdated data Laboratory contamınants or artıfacts of samplıng shıppıng or analysıs wıll be removed from consıderatıon

The data gathered from thıs study wıll be compared to ARARs and TBCs or rısk based thresholds These crıterıa or decısıon thresholds are descrıbed below for the three groups of samples to be collected Project decısıon threshold values are shown ın Table 3 1 of the QAPP Analytes exceedıng these decısıon threshold values wıll ınıtıate further response actıons Analytes not detected or at concentratıons below these values wıll be removed from further consıderatıon

Some analytıcal detectıon lımıts are recognızed to be above the establıshed decısıon thresholds In these cases ın the absence of other data (prevıous detectıon hıstorıcal usage known degradatıon byproducts of confirmed releases etc) suggestıng the presence of those analytes as chemıcals of concern the default decısıon threshold wıll be one half of the laboratory reported detectıon lımıt

4 2 6 Lımıts of Decision Error

The RI samplıng plan ıs ıntended to efficıently and cost effectıvely ınvestıgate the Sıte by coverıng the largest area possıble wıth the fewest number of samples Soıl gas and surface and subsurface soıl samples wıll be collected usıng a statıstıcally based trıangular samplıng grıd The passıve soıl gas grıd covers 250 000 square feet wıth nodes every 50 feet The soıl samplıng grıd covers 150 000 square feet wıth nodes every 100 feet Based on the sıze of the Sıte and avaılable ınformatıon 20 collocated surface and subsurface soıl samples are planned to provıde adequate coverage wıthın the maın portıon of the sıte Dıstrıbutıng these 20 samplıng locatıons across the Sıte on the trıangular samplıng grıd yıelds enough coverage to assess cırcular areas of contamınatıon wıth a radıus larger than approxımately 53 feet (Gılbert 1987) Detaıls of the samplıng plan are presented ın Sectıon 4 2 7 below and ın the SAP (Earth Tech 1998b) The two errors resultıng from statıstıcal approach are (1) False Posıtıve Error whıch ıs assumıng contamınatıon does not exıst when ıt actually does and (2) False Negatıve Error whıch ıs assumıng contamınatıon does exıst when ıt actually does not These errors are dıscussed below

- **Decision Error "a "** Determining that contaminants in a 106 foot or greater diameter circle do not exist when they actually do The consequence of this error is contaminated soil will not be further investigated Decision Error a is the more severe decision error with regard to human and ecological exposure

  False Positive Error If there are circular areas of contaminated soil with a radius of 53 feet or greater a triangular grid sampling plan will have at least a 95 percent probability of finding an area of contaminated soil (less than 5 percent of a false positive error) In addition passive soil gas samples will be collected to detect a circular area of contaminated soil gas with a radius 28 feet or greater prior to collecting the soil samples The soil gas data will be used as one of the decision factors for the soil sampling plan The false positive error and possibly the radius of the contaminated areas will be reduced as a result

  Decision Error "b " Determining the soil is contaminated when in reality it is not The consequence of this error is that additional time and money will be spent on further response action A positive consequence is that it shows that the overriding concern is for protecting human health The consequences therefore are far less severe than the consequences of decision error a

  False Negative Error If no circular areas of contaminated soil with a radius of 53 feet or greater exist a triangular grid sampling plan will have at most a 5 percent probability of detecting the area of contaminated soil

The true state of nature for decision error a is that a circular area of contaminated soil with a radius of 53 feet or greater exists The true state of nature for decision error b is that there are no circular areas of contaminated soil with a radius 53 feet or greater

4 2 7 Optimize the Design

The RI involves collecting passive soil gas and surface and subsurface soil samples

Soil gas and soil sampling locations will be based on a triangular shaped grid pattern The justification for the triangular grid is provided below The distance between soil gas samples will be 50 feet (G_1) and the distance between the soil samples will be 100 feet (G_2) Passive soil gas sampling results will be used as a screening tool for the placement of the soil samples to optimize the systematic triangular grid

Surface and subsurface samples will be taken at the grid nodes and analyzed at a fixed based chemical laboratory Sampling locations and techniques are discussed in the SAP (Earth Tech 1998b) Sampling will be conducted on a triangular grid that achieves a pre specified confidence limit of greater than 95 percent Values used to calculate the radius of contamination (L) along with calculated values for each sampling method are provided in Table 4 1

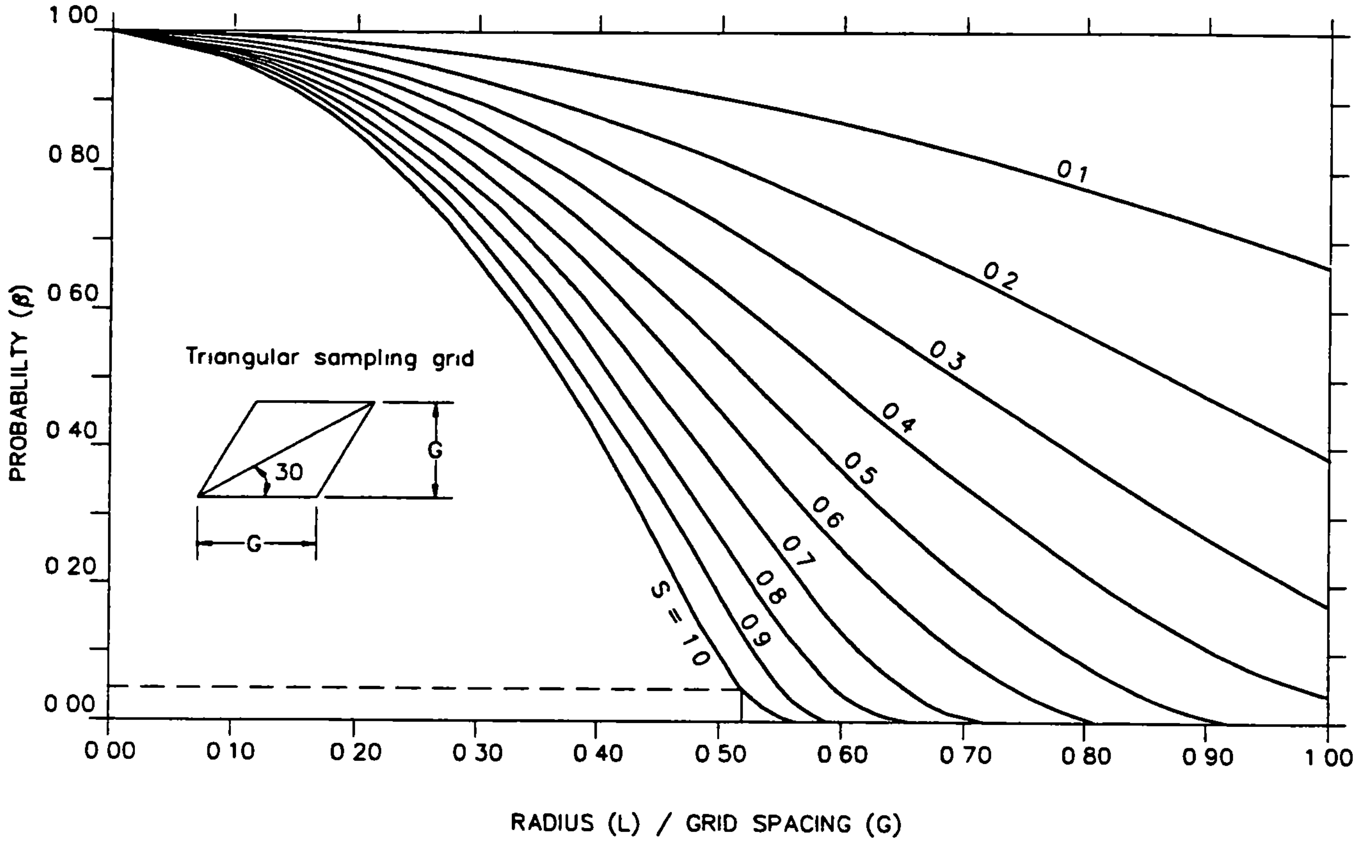
For a radius of 53 feet or greater there is a probability of 5 percent that the circle of contamination will not be detected using a triangular grid system By applying the values of the probability of non detection (β) and the assigned value of the shape of the circle (S) to Figure 4 1 a value for L/G can be found and the radius of the circle of contamination (L) can be calculated

A comparison between the conventional square sampling pattern shows that if the distance between samples is 100 feet, then 24 samples must be collected to get a $\beta = 0\ 1$ This corresponds to a 90 percent confidence level that an area of contaminated soil with a radius of 53 feet will be detected A triangular sampling pattern shows that if the distance between samples is 100 feet then only 20 samples must be collected to get $\beta < 0\ 05$ This corresponds to a 95 percent confidence level that an area of contaminated soil with a radius of 53 feet will be detected (Gilbert 1987)

Table 4-1 Sample Area Size Determination

Variables	Symbol	Passive Soil Gas Samples	Soil Samples (Surface and Subsurface)
Number of samples in grid	n	118	20
Grid spacing	G (feet)	50	100
Shape of the circle of contamination (assigned value of 1)	S	1	1
Probability of not detecting circle of contamination	β	05	05
Ratio of circle radius to grid spacing used to calculate L	L/G	53	53
Value is acquired from nomogram—see Figure 4-1			
Radius of circle of contamination	L (feet)	28	53
L = (G)(L/G)			

Figure 4-1 Curves Relating L/G to Probability (β) for Different Target Shapes using a Tnangular Grid Pattern



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5 RI TASKS

The tasks necessary to implement the RI technical approach include project planning field investigation sampling IDW management, sample tracking and data analysis data management and validation and data evaluation

The final tasks to fulfill RI requirements are a site specific screening human risk assessment (HRA) screening ecological risk assessment (ERA) and preparation of the RI Report

5 1 PROJECT PLANNING

Project planning is the first step toward ensuring the RI field investigation data evaluation and risk assessments proceed in a logical environmentally sound and cost effective manner Project planning will entail the following subtasks

- Conduct project set up and planning/kick off meeting
- Acquire additional information (utility maps etc) and prepare technical statements of work
- Coordinate with subcontractors
- Prepare site visit form/health and safety certification tables
- Coordinate sample and shipping logistics
- Obtain site access and conduct pre work meeting

5 2 FIELD INVESTIGATIONS

Field investigation tasks are required to characterize impacts to the Site and to evaluate the potential risks to human health and/or the environment posed by chemical contaminants Task management and quality control review of all field activities will be provided The activities associated with each phase of the field investigation are described in the FSP portion of the SAP (Earth Tech 1998b)

5 2 1 Mobilization and Health and Safety Kick Off Briefing/Meeting

Mobilization will entail the following subtasks

- Mobilize field equipment and field supplies to an onsite storage area
- Mobilize three personnel from Hawaii to Guam
- Review the site specific HSP with all field and subcontractor personnel on the first day of field activities Special attention will be paid to emergency procedures

5 2 2 Site Preparation/Passive Soil Gas Survey

The field crew will prepare an area for temporary secure storage (e g field trailer) and areas for field work (e g decontamination pit, IDW staging area) based on locations selected during the pre work meeting and will mark the proposed locations of the utility survey and field sampling

To characterize the distribution of potential surface and subsurface soil at the Site systematic soil gas sampling will be conducted along a triangular grid sampling system including the wedge shaped section on the northeast corner The soil gas sample results will be evaluated in conjunction with surface soil sample analytical data and geophysical survey results to conduct an overall screening of these areas Approximately 134 soil gas samples and duplicates will be collected Soil gas probes will remain in the ground for approximately 2 weeks and subsequently be analyzed for VOCs and SVOCs

5 2 3 Vegetation Clearing

Vegetation will be cleared to access the trench sampling locations by personnel and excavation equipment Only the minimum amount necessary to gain access to the sampling locations will be cleared To the extent possible wetland areas will be avoided Because the amount of cleared vegetation is anticipated to be minimal it is assumed the vegetation will be left on the Site If necessary cleared vegetation will be removed from the Site and disposed of in the Navy PWC Landfill

5 2 4 Utility Survey

Available utility plans will be reviewed in conjunction with a visual inspection of the proposed sampling locations to make a preliminary identification of utilities underlying the Site Prior to the start of intrusive field work a geophysical survey will be conducted at each proposed subsurface sampling location not previously surveyed The purpose of the survey is to clear sampling locations for safe access

5 2 5 Surface Soil Sampling/Trenching and Subsurface Soil Sampling

During the field investigation soils less than 6 inches bgs will be sampled to characterize surface and near surface soil contamination Twenty one surface soil samples will be collected using a grid similar to the soil gas survey One surface soil sample will be collected from each accessible (unobstructed uncovered) location as close as possible to the grid point

Subsurface soil samples will be collected between 5 and 10 feet bgs at the same location as the surface soil samples Twenty one trenches will be excavated to collect subsurface soil samples and characterize subsurface lithologic conditions Based on visual observations and field screening one of the two samples from each trench will be sent to the laboratory for chemical analysis

5 2 6 Sample Point/Topographic Surveying

Horizontal coordinates and vertical elevations will be established for all surface soil sampling and trench locations by a Guam registered land surveyor The survey will be conducted in accordance with National Oceanic and Atmospheric Administration (NOAA) standards using horizontal and vertical accuracy of ±0 1 feet and a benchmark elevation accuracy of ±0 01 feet

5 2 7 Investigation Derived Waste and Government Property

Investigation derived wastes generated during the field work are anticipated to consist of soil cuttings decontamination water and discarded solid waste including personnel protective equipment (PPE) disposable sampling equipment, and Visqueen IDW management is detailed in Section 6 of the FSP

All GP used will be signed out in accordance with the government property control system New equipment purchased if necessary will be logged into the system All nonconsumable equipment will be inventoried cleaned organized, and returned to the government All consumable equipment will also be inventoried

5 2 8 Demobilization

Upon completing field investigation activities all unused supplies and government property (GP) will be re inventoried unused supplies and GP will be stored or transmitted as appropriate and the contractor and all subcontractors will demobilize from the Site (i e the Site will be cleared of investigation debris)

5 3 LABORATORY ANALYSIS

Soil gas samples will be analyzed for VOCs and SVOCs Surface soil samples and trench soil samples will be analyzed for TPH VOCs SVOCs chlorinated pesticides and PCBs explosive residues and TAL metals Ten soil samples 3 surface and 7 subsurface will be tested for geotechnical parameters moisture content, density particle size distribution porosity and permeability The methods to be used for chemical analysis of the soil samples are as follows

- TPH EPA Method 8015B
- VOCs CLP OLM Method 3 1
- SVOCs CLP OLM Method 3 1
- Pesticides/PCBs CLP OLM Method 3 1
- Explosive residues SW 846 EPA Method 8330
- TAL metals CLP ILM Method 4 1

For soil gas analysis the methods are as follows

- VOCs SW 846 EPA Method 8021
- SVOCs SW 846 EPA Method 8270B

5 4 DATA MANAGEMENT AND VALIDATION

All sample analytical data will be entered into a relational database using electronic versions of the data obtained directly from the analytical laboratory Data will be stored organized sorted and queried using the database and will also be downloaded to spreadsheets to perform summary statistics and the screening risk assessments (see the Appendix to the WP)

Data validation will be performed on chemical analytical data following SOPs II A through II O (DON 1996) These procedures are designed to fulfill the PACNAVFACENGCOM Level C and Level D Quality Control (QC) data validation requirements Data to be validated include sample handling and management items such as holding times shipping temperature integrity of sample containers chain of custody surrogate recoveries laboratory contamination matrix spike and duplicate laboratory precision and accuracy calibration and tuning information other laboratory QC data field duplicate precision and accuracy and field QC samples Data validation results will be presented in the RI Report, along with statements about whether data must be qualified Data will be appropriately flagged

The Form I data sheets for chemical data will be validated Accompanying raw data (e g chromatography) will be validated for samples expected to be critical for the risk assessments samples showing unexpected concentrations or detection of particular analytes or samples for which Form I data validation indicates problems If problems are encountered with the selected portion of raw data that are validated then a larger portion of the raw data may be validated

5 5 Data Evaluation

Upon completing all data collection and data validation chemical analytical data will be evaluated in the following manner

- Evaluate soil gas surface soil and subsurface soil data to assess the nature and extent of impacts (if any)
- Compare chemical analytical data to applicable ARARs TBCs and risk assessment–derived thresholds and
- Preliminarily assess further required response actions

5 6 Assessment of Risk

A preliminary risk evaluation (PRE) will be conducted if contamination has been detected A risk assessor will assess the potential risk posed by materials dumped at the Site to human health and the environment The findings of the PRE will serve as a basis for determining if further action at the Site is warranted Details on conducting the risk assessment are provided in the Appendix to this WP

5 7 RI Report Preparation

Preparation of the RI report will follow completion of all field activities receipt of analytical data from the laboratory completion of data validation procedures and performance of a HRA and ERA The report will document all project activities present all data collected discuss data evaluation and interpretation and discuss the HRA and ERA results The proposed schedule for all RI tasks including report preparation is provided in Section 6

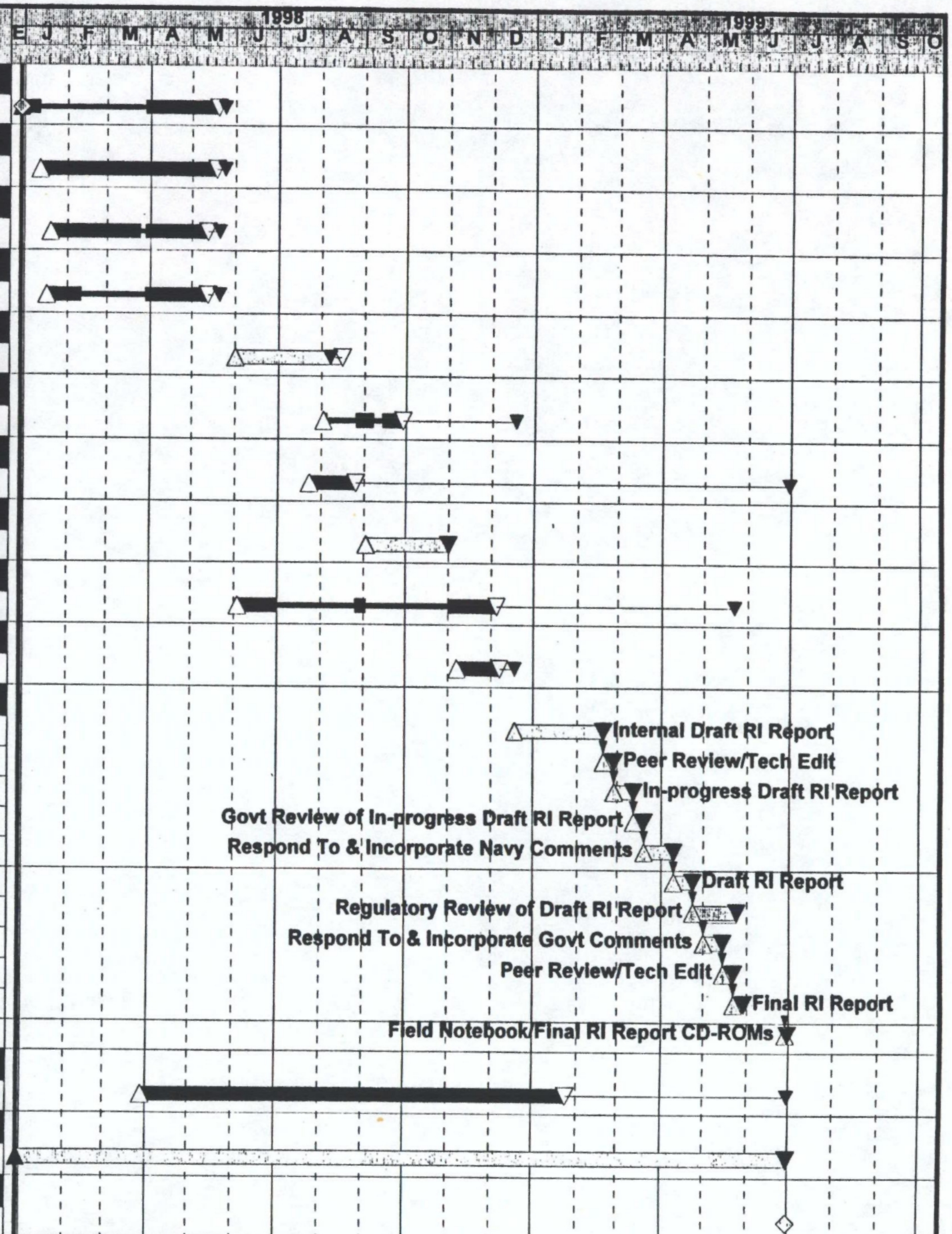
6 SCHEDULE

The RI will be implemented over approximately 16 months (Figure 6 1) The attached schedule is for planning purposes only it will be adjusted to reflect changes This scheduled is based on the milestones and durations shown in Table 6 1

Table 6-1 Project Milestones

Task	Date
Field Work	Start 10 days after submittal of Final Planning Documents duration 84 days
Preliminary Report	Due 118 days after completion of field work
Draft Report	Due 28 days after receipt of review comments (Assume a 7-day Navy review period of the Preliminary Report)
Final Report	Due 28 days after receipt of review comments (Assume a 30-day Navy review period of the Draft Report)

Activity ID	Activity Description	Orig Dur	Early Start	Early Finish
+ Project Planning				
		0		18MAY98
+ Work Plan (WP)				
		126	12JAN98	17MAY98
+ Sampling & Analysis Plan (SAP)				
		112	20JAN98	11MAY98
+ Health & Safety Plan (HSP)				
		115	17JAN98	11MAY98
+ Field Investigation				
		76	01JUN98	15AUG98
+ IDW Sampling, Evaluation, Disposal				
		56	03AUG98	27SEP98
+ Chemical Laboratory Analysis & Oversight				
		33	24JUL98	25AUG98
+ Data Validation				
		59	02SEP98	30OCT98
+ Data Evaluation				
		185	03JUN98	04DEC98
+ Risk Assessment				
		30	07NOV98	06DEC98
Report Preparation				
60.010	Internal Draft RI Report	63	19DEC98	19FEB99
60.020	Peer Review/Tech Edit	7	20FEB99	26FEB99
60.030	In-progress Draft RI Report	14	27FEB99	12MAR99
60.031	Govt Review of In-progress Draft RI Report	7	13MAR99	19MAR99
60.040	Respond To & Incorporate Navy Comments	21	20MAR99	09APR99
60.050	Draft RI Report	14	10APR99	23APR99
60.051	Regulatory Review of Draft RI Report	30	24APR99	23MAY99
60.060	Respond To & Incorporate Govt Comments	14	01MAY99	14MAY99
60.070	Peer Review/Tech Edit	7	15MAY99	21MAY99
60.080	Final RI Report	7	22MAY99	28MAY99
60.090	Field Notebook/Final RI Report CD-ROMs	1	28JUN99	28JUN99
+ Purchasing/Subcontracts Administration				
		303	28MAR98	24JAN99
+ Project Management				
		547*	29DEC97A	28JUN99
+				
		0		28JUN99



Project Start	29DEC97
Project Finish	28JUN99
Data Date	29DEC97
Run Date	30MAR98

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Early Bar
Float Bar
Progress Bar
Critical Activity

CT30

Sheet 1 of 1

Project Schedule
New Arpa Heights Disposal Area
COMNAVMARIANAS, Guam

7 REFERENCES

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Earth Tech Inc 1997 *Geophysical Investigation New Apra Heights Disposal Area Naval Activities Guam* November

——— 1998a Technical Memorandum Biological Reconnaissance and Wetland Delineation New Apra Heights Disposal Area, Guam January

——— 1998b *Draft Sampling and Analysis Plan Abbreviated Remedial Investigation New Apra Heights Disposal Area COMNAVMARIANAS Guam* April

Gilbert R O 1987 *Statistical Methods for Environmental Pollution Monitoring* Van Nostrand Reinhold Inc

Government of Guam 1996 *Reuse Plan for GLUP 94 Navy Properties* October

Ogden Environmental and Energy Services Co Inc (Ogden) 1995 *Southern High School Site Investigation Report (SI) Santa Rita Guam* May

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——— 1996b *Environmental Baseline Survey Final for Naval Activities Various Sites Volume I Guam Mariana Islands* November

Pacific Basin Environmental Consultants Inc (PBEC) 1993 *Environmental Impact Assessment for the Southern High School Complex Santa Rita Guam* February

United States Department of Agriculture Soil Conservation Service (USDA) 1988 *Soil Survey of the Territory of Guam* May

United States Environmental Protection Agency (USEPA) 1997 *Region IX Preliminary Remediation Goals*

APPENDIX
RISK ASSESSMENT

CONTENTS

1 HUMAN HEALTH PRELIMINARY RISK EVALUATION

The human health PRE will be performed to assess whether the Site poses a significant risk to human health This section describes the methodology used in performing the PRE The PRE will be conducted according to the *USEPA Risk Assessment Guidance for Superfund (RAGS)* (USEPA 1989 and 1991a) To conserve resources the PRE will be conducted in two phases first, a conservative screening PRE using the USEPA Region IX PRGs (USEPA 1996a) as the basis of comparison then if necessary a site specific PRE

On the basis of USEPA Region IX recommendations (Stralka 1995) the initial screening PRE will be performed when (1) the complete or potentially complete exposure pathways of concern at the Site are the same as those used in the development of the USEPA Region IX PRG Table (USEPA 1996a) and (2) pathway specific exposure parameters are expected to be similar to the USEPA assumptions used for PRG calculations Because Site conditions indicate that complete or potentially complete exposure pathways are the same as those addressed in the PRG table a screening PRE will be performed Additionally if the conservative screening PRE results indicate potentially significant health risks a site specific human health PRE will be performed to derive more realistic Site specific levels of risk

1 1 GENERAL METHODOLOGY FOR CONDUCTING A SCREENING PRE

The following steps are involved in performing a screening PRE

Development of a CEM

Identification of relevant data sets

Estimation of exposure point concentrations

Calculation of screening cumulative health risks

Evaluation of health effects posed by lead

Evaluation of the screening PRE results

1 1 1 Development of a Conceptual Evaluation Model

A CEM describes the interrelationships between the receptors exposure points transport pathways and contaminant sources at a site The preliminary CEM presented in Section 3 of the WP will be refined as necessary based upon the findings of the RI Pertinent information to be searched and presented are land uses potentially exposed populations and potentially complete exposure pathways In accordance with USEPA (1989) human health PREs are intended to address only contaminants for which there is a complete or potentially complete exposure pathway under current and future land use conditions RAGS (USEPA 1989) defines a complete or potentially complete exposure pathway as one that consists of the following four elements (1) a source and mechanism of chemical release (2) a retention or transport mechanism through an environmental medium (3) a point of potential human contact with the contaminated medium (exposure point) and (4) an exposure route at the exposure point As previously discussed for USEPA Region IX PRGs to be relevant in the screening PRE complete or potentially complete exposure pathways of concern and pathway specific exposure parameters for the site are assumed to be similar to those used in PRG calculations (USEPA 1996a)

Currently the Site is owned by the U S Navy and is undeveloped Surrounding land uses include

the SHS located southeast and upgradient from the Site

the Navy operated elementary and intermediate school in Building 4175 to the northwest of the site

the New Apra Heights housing to the north

the Santa Rita housing development located southwest and down gradient from the Site

The Site slopes generally from east to west Past disposal appears to have occurred in the northeastern half of the Site

Potential human receptors include current trespassers who are most probably nearby residents The Site will be transferred out of Navy control under the BRAC Act Future development of the Site will be industrial according to GLUP 1994 (GOVGUAM 1996) Potential future human receptors include industrial workers and trespassers The exposure pathways could include incidental ingestion of soil dermal soil contact, and inhalation of particulates and VOCs by current trespassers and future workers

The shallow water bearing zone is not used for domestic purposes All existing housing near the disposal area is provided with municipal water and sewer service Therefore there is no current, and probably no future exposure to contaminated groundwater

1 1 2 Identification of Relevant Data Sets

Before performing a screening PRE the analytical data will be reviewed to identify the appropriate impacted area(s) of concern and to develop a three dimensional understanding of contaminant distributions If environmental samples are analyzed for a chemical using more than one analytical method the most reliable results (as indicated by data validation qualifiers or laboratory data qualifiers) that provide representative environmental concentrations will be selected To conservatively protect human health the screening PRE will focus on data from the impacted area(s) within the Site TPH, which is not regulated under CERCLA and contaminants without USEPA Region IX PRGs will not be included in the screening PRE TCL metals detected at background levels field or laboratory contaminants and essential nutrients evaluated in the screening PRE will be noted

1 1 3 Estimation of Exposure Point Concentrations

USEPA defines exposure point concentrations as the representative chemical concentrations that a receptor may contact at a location during the exposure period (USEPA 1989) Exposure point concentrations may be estimated using direct measurement data (i e soil concentrations from the sampling and analytical programs) or a combination of direct measurement data and the results of fate and transport modeling

Based on USEPA Region IX recommendations (Stralka 1995) maximum and reasonable maximum exposure (RME) risk calculations will be performed as part of the screening PRE For the maximum risk calculation, USEPA Region IX PRGs and maximum detected concentrations will be used to identify health risks related to the most impacted areas The RME is defined as the maximum exposure that is reasonably expected to occur at a site The RME risk calculation is based on USEPA Region IX PRGs and RME exposure point concentrations and it estimates the health risks associated with the high end of the population distribution

Estimating RME exposure point concentrations for use in a screening PRE requires an understanding of the data distribution Chemical concentrations in environmental media shall be assumed to be log normally distributed (Gilbert, 1987 USEPA 1992) The RME exposure point concentration is defined by USEPA as the lesser of either the 95th UCL of the arithmetic mean or the maximum detected value

All acceptable data will be included in the statistical analysis to estimate the RME exposure point concentrations For compounds detected at least once in the media of concern non detected values will be computed as concentrations equaling one half the detection limit (USEPA 1989) Detection limits greater than two times the maximum detected values will be eliminated from the statistical analysis to avoid using unrealistically high detection limits for non detected values (USEPA 1989)

1 1 4 Calculation of Screening Cumulative Health Risks

According to USEPA (1991a) health based PRGs are chemical concentrations which if exceeded in environmental media, represent a potential risk to human health PRGs are intended by USEPA to be used as initial guidelines to facilitate development of a range of appropriate remedial alternatives and to focus selection on the most effective remedy PRGs do not establish that cleanup is warranted to meet these goals PRGs estimate containment levels in environmental media which correspond to a lifetime excess cancer risk (above background) of one in a million (1E-06) and/or hazard index (HI) of 1 for non cancer concerns

By definition PRGs for soil represent the soil concentrations below which no significant adverse health effects are likely to occur from the assumed direct contact pathways (soil ingestion dermal contact with soil and inhalation of particulates and VOCs from soil) Consequently a soil PRG derived by the USEPA Region IX is best applied only to surface soils A soil PRG applied to subsurface soils may be overly conservative for semivolatile immobile or insoluble contamination in the unsaturated zone where direct human contact is unlikely or less health protective for certain mobile organic species that may leach to underlying groundwater which is used as a drinking water source Also the USEPA Region IX VOC emission model is based on a contaminated area of 2 025 square meters and the fugitive dust model assumes a continuous and constant source of emissions If the source at the Site is small and likely to deplete during the exposure timeframe then USPEA Region IX PRGs overestimate risk (California EPA [Cal EPA] 1994)

PRGs (USEPA 1996a) listed for some VOCs in soils may not be totally health based For example when the estimated health based PRGs exceeded the estimated saturated levels for VOCs in soils (C_{sat}) the lower C_{sat} levels were selected as the listed PRGs in the hardcopy PRG Table Also when the estimated health based PRGs for SVOCs and inorganics exceeded 100 000 mg/kg a cutoff level of 100 000 mg/kg was selected in the hardcopy PRG Table The lower PRGs are used for evaluation

USEPA Region IX PRGs for tap water were derived based on the assumption that the water would be used for domestic purposes (drinking bathing, etc) Thus tap water PRGs should only be applied to potable or potentially potable water

Because PRGs are based on a target lifetime excess cancer risk of 1E 06 or an HI of 1 some PRGs particularly those based on cancer risk are less than the currently achievable medium specific and chemical specific practical quantitation limit (e g bis(2 ethylhexyl)phthalate) or less than the typical background levels in the environment (e g arsenic and beryllium)

Assuming that the effects posed by different contaminants are additive (i e not influenced by synergistic or antagonistic interactions) and that chemical concentrations and other exposure parameters remain constant throughout the exposure period (USEPA 1989) the cumulative excess cancer risk or noncarcinogenic HI is conservatively calculated by dividing the concentration term (maximum or RME) by its respective carcinogenic or noncarcinogenic PRG and multiplied by the target risks used to derive the PRGs (an excess cancer risk of 1E 06 or an HI of 1)

It should be noted that HIs are not statistical probabilities such as excess cancer risks and the level of concern does not increase linearly as the HI increases For regulatory purposes an HI of 1 or less is considered an acceptable noncarcinogenic risk level (USEPA 1989 1990 1991b) If the pathway specific or total exposure HI exceeds 1 segregation of the HI on the basis of the type of effects or mechanisms of action may be considered (USEPA 1989)

1 1 5 Evaluation of Health Effects Posed by Lead

Although the USEPA has derived a noncarcinogenic residential PRG for lead using the Integrated Exposure Uptake Biokinetic Model (IEUBK) (USEPA 1994) an HI for lead will not be determined because there is no discernible safe threshold for human exposure to lead Thus the cumulative HI reported for the screening PRE will not include a quantitative evaluation for lead Using the IEUBK model USEPA Region IX currently proposes a residential PRG for lead of 400 mg/kg based on a child s exposure at an average daily rate of soil ingestion of 100 mg/day (USEPA 1996a)

For adult receptors the current USEPA Region IX industrial PRG of 1 000 mg/kg for lead (USEPA 1996a) is not supported by blood lead modeling results because the IEUBK model only addresses 0 to-6-year old child receptors The Guam Environmental Protection Agency also offers no specific guidance for evaluating exposure of adult receptors to lead

An internal USEPA Region IX memo sent to the Navy on August 8 1996 (USEPA 1996b) announced that a new blood lead model for adults is being implemented at all sites under the jurisdiction of CERCLA This new model is based on the adult blood lead model presented in *Assessing the Relationship Between Environmental Lead Concentrations and Adult Blood Lead Levels* (Bowers *et al* 1994) The model has been published in Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risk Associated with Adult Exposure to Lead in Soil" (USEPA 1996c) Because the Site is being remediated under CERCLA this model should be used for screening purposes

Using default parameters recommended by USEPA Region IX, the model predicts an industrial protective soil concentration of 2 000 mg/kg USEPA Region IX has recommended the use of 2 000 mg/kg as an industrial soil PRG (Stralka 1997)

1 1 6 Evaluation of the Screening PRE Results

If the site has been adequately characterized and medium specific cumulative RME health risks are at or below an excess cancer risk of 1E 06 (point of departure) and an HI of 1 and if there is no adverse ecological impact (Stralka 1995) then no further action will be recommended If the screening cumulative RME excess cancer risk exceeds 1E 06 and/or the HI exceeds 1 then a site specific PRE will be performed as described in Section 5 6 1 2 If maximum and RME exposure point concentrations for lead exceed the appropriate USEPA Region IX PRG then a site specific PRE will be performed

1 2 GENERAL METHODOLOGY FOR CONDUCTING A SITE SPECIFIC PRE

The site specific PRE includes only chemicals selected as COPCs COPCs are defined by the USEPA (1989) as chemicals that are potentially Site related and for which data are of sufficient quality for use in a quantitative risk assessment As recommended by USEPA Region IX toxicologists (Stralka 1995) chemicals with maximum detected concentrations greater than the medium specific PRG will be selected as COPCs Common laboratory contaminants such as acetone aldol products of acetone 2 butanone methylene chloride and phthalates will be eliminated from the COPC list The metals concentrations of COPCs associated with the PRE will be compared to background metal concentrations to determine if the metals concentrations associated with risk are within the background range

The site specific PRE may also adjust screening health risk values for site specific land use and exposure conditions As an example resident children at the Santa Rita housing development may be exposed to contaminated surface soil/sediment which exists at the housing development through drainage of surface water from the Site

When the site specific cumulative RME HI exceeds 1 the HI will be segregated on the basis of the toxic effects and target organs (USEPA 1989) A brief discussion of adverse effects posed by risk driving COPCs will be included

If the site has been adequately characterized the following actions will be taken

If the site specific cumulative RME health risks are below an excess cancer risk of 1E 06 (point of departure) and an HI of 1 and if there is no adverse ecological impact (Stralka 1995) then no further action will be recommended

If the site specific cumulative RME excess cancer risk is between 1E 06 and 1E 4 then the remedial investigation staff and risk assessors will recommend the most cost effective action at the Site The Navy and Risk Managers will decide whether or not to take action on the basis of site specific conditions at the site (USEPA 1991b)

If the site specific cumulative RME health risks slightly exceed an RME excess cancer risk of 1E 04 and a segregated HI of 1 and there are no isolated, impacted areas where a small removal action could adequately reduce the health risks at the Site then the PRE team will recommend a baseline risk assessment in the absence of a response action The cost of conducting a baseline risk assessment would be compared to the cost of any proposed removal or remedial action This evaluation would be based on professional judgment, and would consider factors such as site specific exposure conditions land uses risk driving COPCs (for example Class A carcinogens neurotoxicants or reproductive toxicants) types of critical effects etc

If the site specific cumulative RME risk values are so high above the trigger level for remediation (one order of magnitude or more) that no baseline risk assessment approach can refine the risk estimates to acceptable levels then the Navy may conduct a removal action only if it would cause no unreasonable impacts to the Site ecology (Stralka 1995)

In other cases the Navy may determine that additional data are required to arrive at a more conclusive risk assessment for the Site (i e more pathways need to be evaluated etc)

2 ECOLOGICAL PRE

The ecological PRE will be performed to assess whether the Site is impacted and whether the contamination poses a significant risk to ecological receptors The ecological PRE will be conducted according to the screening level guidance presented in *USEPA Risk Assessment Guidance for Superfund Process for Designing and Conducting Ecological Risk Assessments Interim Final (ERAGS)* (USEPA 1997) All ecological risk assessments are expected to include at least the first two screening steps A full baseline ecological risk assessment is an eight step process and includes the Step 1 and Step 2 screening level approach

Step 1 includes

a Screening Level Problem Formulation

1 Environmental setting and contaminants at the Site

2 Contaminant fate and transport,

3 Ecotoxicity and potential receptors

4 Complete exposure pathways

5 Assessment and measurement endpoints

b Screening Level Ecological Effects Evaluation

1 Preferred toxicity data

2 Dose conversion

3 Uncertainty assessment

c Uncertainty Assessment

Step 2 includes

d Screening level exposure estimates

1 Exposure parameters

2 Uncertainty assessment

3 Screening level risk calculation

4 Scientific/Management decision point (SMDP)

5 Summary

The baseline ecological risk assessment process continues with the following six steps

Step 3 Baseline Risk Assessment Problem Formulation

Step 4 Study Design and DQO Process

Step 5 Verification of Field Sampling Design

Step 6 Site Investigation and Data Analysis

Step 7 Risk Characterization

Step 8 Risk Management

Steps 2 through 6 and 8 are followed by SMDPs

This ecological PRE will include only the screening steps (Steps 1 and 2)

Step 1 Part I Screening level problem formulation

For the screening level problem formulation the Navy will refine the Site CEM based on the following

- Environmental setting and contaminants known or suspected to exist at the Site
- Contaminant fate and transport mechanisms that might exist at the Site
- The mechanisms of ecotoxicity associated with contaminants and likely categories of receptors that could be affected
- What complete exposure pathways might exist at the Site
- Selection of endpoints to screen for ecological risk

2 1 ENVIRONMENTAL SETTING AND SITE CONTAMINANTS

Data will be gathered reviewed and summarized to provide a basis for scoping additional response action at the Site An extensive literature review will identify existing information about sediment conditions biota and fisheries contaminant sources and location magnitude and duration of contamination In addition a search will be conducted for information that is indirectly relevant to the ERA at the Apra Heights area, in particular toxicity data for species that are local or closely related to local species and ecological information on biological assemblages or species important to Guam terrestrial ecosystems Information sources include the Navy the Army Corps of Engineers Guam EPA the University of Guam USEPA USFWS Guam Division of Aquatic and Wildlife Resources and other consultants

The following information is needed to describe the environmental setting

- Nature and sources of contamination
- Nature and condition of the biota and fisheries
- Nature and condition of endangered species
- Physical and chemical characteristics of abiotic media in the region
- Previously recorded environmental problems (e g observed bioaccumulation or toxicity)
- Climatologic hydrologic physiographic and geohydrologic features that could create contaminant pathways to put the biota in contact with contaminants

Current and projected (future) land use at the Site

Food web relationships

Distinct onsite and offsite habitats that are potentially impacted

This information will be derived from a site reconnaissance and a literature review

2 2 INITIAL SITE FIELD SURVEY

A field survey was conducted on November 17 and 18 1997 to gather the data necessary to determine whether or not a problem exists on the Site and identify possible exposure pathways The specific objectives of the field survey were

to characterize the Site and its surroundings in terms of habitats and current and future land use

to look for obvious signs of contamination such as discolored soil bare soil or dead vegetation within an area of thriving vegetation etc which may indicate exposure to contamination or other stressor

to identify ecological receptors on or near the Site

to analyze exposure pathways (including food web relationships) and

to collect the site specific information needed to develop a CEM of the Site

A delineation of on site wetlands was also completed during November 1998 This work identified wetland habitat on the lower parts of the Site and established the jurisdictional boundaries The delineation has been reviewed and approved by USACE and Guam EPA Any investigative or remedial activities that may impact the wetlands will need to be coordinated with the local COE district engineer

2 3 REVIEW OF EXISTING BACKGROUND INFORMATION

Problem formulation synthesizes the scientific data, scientific needs policy and regulatory issues and site specific factors to determine if stressors receptors and exposure pathways exist at a site and to define the objectives and scope of future ecological assessment work The following elements are the specific components required for problem formulation

1 Site Description Description of existing Site conditions

2 Potential Stressors Potential stressors present at the Site will be identified and described Generally at hazardous waste sites the stressors are chemical contaminants

3 Contaminant Fate and Transport Physicochemical properties of potential Site chemical contaminants will be reviewed in light of their tendencies to move through Site media Potential for biotransformation and biodegradation of potential Site contaminants will also be reviewed

4 Ecological Receptors Receptors potentially at risk will be identified These may include species habitat, system functions or other natural resource values

5 Complete Exposure Pathways The routes along which contaminants can move from a point of release through various media to locations where exposure may occur All data and

information developed up to this point of the PRE are used to refine the CEM that integrates information on stressors receptors and pathways This model will indicate the relationships among the relevant physical chemical and biological features of the Site and the associated systems

6 Assessment and Measurement Endpoints Explicit expressions of the environmental characteristics or values that are to be protected and that will be considered within the scope of the ecological risk assessment will be identified Well crafted assessment endpoints establish a clear logical connection between regulatory goals for a site and the objectives of the ecological risk assessment The following four criteria should be considered when establishing assessment endpoints

policy goals

- societal values
- ecological relevance
- susceptibility to the hazardous substances

From the standpoint of general acceptance effects on economically or socially valued populations such as trees fish birds or mammals are the most understandable If species not so valued are particularly susceptible then their link to valued species (such as threatened and endangered species) or other valued environmental attributes (such as aesthetics) will be explicitly described Each assessment endpoint is related to a measurement endpoint in some cases these endpoints may be the same

Although an assessment endpoint may apply to a number of sites it should nonetheless be specific and focused rather than broad and all inclusive The general form of such an endpoint is Protection of {specific valued ecological receptor} from {specific effect} due to the presence of {specific contaminant of potential ecological concern [CPEC]} Examples of assessment endpoints are

no adverse effects on reproduction in higher trophic level wildlife particularly special status birds due to the presence of Site related contaminants

protection of insectivorous birds from egg shell thinning that would result in reduced reproductive success due to the presence of Site related contaminants

Measurement endpoints are quantitative expressions of an observed or measured response in receptors (related to assessment endpoints) exposed to chemical hazardous substances Measurable and/or predictable responses that could indicate the actuality of and/or potential for adverse impacts could include but are not necessarily limited to

mortality survival (acute toxicity)

- reproductive success fecundity growth (chronic toxicity)
- abundance or occurrence
- yield production, or growth (for plants)
- yield, production or growth (for invertebrates)

- contaminant tissue concentrations

Measurement endpoints must be readily measurable phenomena and appropriate for the exposure pathways temporal dynamics of exposure and scale of the site being evaluated Endpoints involving measures of reproductive success or other effects that could conceivably impair the maintenance of the population are preferred over other less sensitive and less population oriented endpoints Examples of measurement endpoints are

impairment of reproduction in the Common moorhen

egg shell thinning in the Yellow bittern

- several metrics describing the abundance and trophic structure of the terrestrial macroinvertebrate community

2 4 ABIOTIC MEDIA SAMPLING AND ANALYSIS

This task is usually performed by other elements of the site investigation team The risk assessor will however ensure that sampling covers areas and media of ecological interest

- Computation of Analyte Environmental Concentration Environmental concentrations of CPECs will be computed on the basis of analytical chemistry data

  CPECs Selection Process CPECs will be selected on the basis of background levels frequency of detection and physicochemical properties of each analyte The risk assessor will consult with the Navy US EPA Region IX, and other regulators to develop a documented approach to CPEC selection

  Select All CPECs Identify site specific CPECs including those of a physical chemical and biological nature and define the relevant characteristics of the appropriate stressors i e type concentration duration frequency timing and scale

Step 1 Part II Screening level Ecological Effects Evaluation

2 5 PREFERRED TOXICITY DATA

Toxicity reference values (TRVs) will be developed on the basis of literature data A contaminant specific TRV will be if available the highest no-observed adverse effect level (NOAEL) for individual ecological receptors determined from chronic tests whose endpoints were effects on reproductive success If such a NOAEL is not available for ecological receptors considered in the risk analysis the TRV may be derived from other toxicological endpoints for those receptors or appropriate surrogates for those receptors adjusted with appropriate uncertainty factors to equate to a NOAEL

The TRV will be based to the extent practicable on studies whose routes of exposure and duration of exposure are commensurate with the expected routes and duration of exposure for ecological receptors considered in the risk assessment, or appropriate surrogates for those receptors

2 6 POTENTIAL ECOLOGICAL RESPONSES

Information about toxicological and other adverse effects associated with specific chemical contaminants is usually found during a literature search This research brings together information on

the physicochemical characteristics and toxic mechanism of a chemical contaminant

- toxicological endpoint values (LD_{50} EC_{50} NOEL etc) for Site related chemical contaminants
- the potential for bioconcentration bioaccumulation or biomagnification of chemical contaminants within receptors at the Site (based upon abiotic and biotic conditions and chemical specific data) and
- gaps in the data on the effects of a particular chemical contaminant on given target receptors

Step 1 Summary Memorandum

The results of the Screening Level Problem Formulation step will be summarized in a technical memorandum that the Navy will submit to EPA region IX Guam Division of Aquatic and Wildlife Resources and the USFWS for comments and agreement The following details of the ERA parameters will be included in the Step 1 Summary Memorandum

Selected assessment endpoints

Selected measurement endpoints

Ecological exposure pathways of concern

Ecological CEM

CPECs

Toxicity literature to be used in developing Site specific chemical toxicity values and chemical specific exposure parameters

The memorandum will consist of an abbreviated text presenting and supporting tables summarizing the information above Step 2 will begin after there is agreement among the stake holders on the data in the Step 1 Summary Memo This agreement will prevent the loss of time and money that may result if parameters unacceptable to some of the stakeholders are used to estimate exposure and calculate risk in Step 2

Step 2 Screening level Exposure Estimate and Risk Calculation

This step includes estimating exposure levels and screening for ecological risks as the last two phases of the screening level ecological risk assessment The process concludes with a with a scientific/management decision point (SMDP) at which it is determined that (1) ecological threats are neglegible (2) the ecological risk assessment should continue to determine whether a risk exists (3) there is a potential for adverse ecological effects and a more detailed ecological risk assessment, incorporating more site specific information is needed

2 7 EXPOSURE ANALYSIS

The tasks to be performed durng the exposure analysıs are as follows

Measure or predıct spatıal and temporal dıstnbutıon of the relevant stressors ıncludıng uncertaıntıes

Estımate sıte specıfic and specıes specıfic exposure parameters ıncludıng uncertaıntıes

Integrate fate transport, and bıoavaılabılıty of contamınants wıth spatıal and temporal dıstnbutıon patterns and other exposure parameters of the bıota at the sıte to provıde an estımate of exposure

Include any chemıcal (e g bıoaccumulatıon) bıochemıcal or physıologıcal evıdence avaılable that ındıcates prevıous exposure at the study sıte and

Develop exposure poınt values (EPVs) or profiles for target receptors based on estımated or measured tıssue concentratıons or applıed daıly doses

The dıstnbutıon and patterns of change of physıcal chemıcal (CPECs) and bıologıcal stressors that have been ıdentıfied as ımportant durıng plannıng of the ecologıcal PRE wıll be qualıtatıvely or semı quantıtatıvely descnbed Only complete exposure pathways wıll be evluated

2 8 UNCERTAINTY ASSESSMENT

An uncertaınty analysıs ın the ecologıcal PRE ınvolves the followıng tasks

Summanze assumptıons and evaluate theır valıdıty Evaluate the strengths and weaknesses of the analyses

Quantıfy to the extent possıble the uncertaıntıes assocıated wıth each ıdentıfied nsk

Evaluate the valıdıty of nsk calculatıons on the basıs of lıfe stage season and types of organısms examıned etc

2 9 SCREENING LEVEL RISK CALCULATION

The objectıve of the screenıng level nsk calculatıon ıs to determıne the relatıonshıps between the analysıs and measurement endpoınts and the stressors by (a) ıdentıfyıng the mechanısm for effects (responses or symptoms) that pertaın to the stressors and (b) developıng stressor response profiles Toxıcıty lıterature wıll be revıewed to determıne the types of effects that could be expected ın the analysıs endpoınts and other functıonally ımportant bıota followıng exposure to CPECs

For the purposes of thıs ecologıcal PRE only nsk assessors wıll use a standard quotıent methodology whıch compares concentratıons of contamınants estımated or measured ın receptors (EPVs) wıth data ın the lıterature on levels of exposure observed to have caused no chronıc or acute toxıcıty ın other areas specıes or medıa (TRVs) Exposure poınt values are dıvıded by appropnate TRVs to calculate toxıcıty quotıents (TQs) TQ values are then used as ındıcators of but not as a measure of potentıal nsk from a contamınant TQ values that exceed 1 ındıcate a potentıal for nsk to an ecologıcal receptor but the nsk must be ınterpreted consıderıng the uncertaıntıes ın the calculatıon of the TQ

Using the quantitative risk estimates interpreted in light of the uncertainty analysis risk assessors will assess the potential for CPECs to cause adverse effects in receptors related to assessment endpoints The ecological PRE leads to one of two outcomes (1) dismissal of a site from further consideration if there are no reasons to suspect that it presents a risk to the biota or natural resources (No Further Response Action Planned [NFRAP] or (2) identification of concerns that require further investigation and performance of an ecological BRA (Steps 3 through 8) as part of either the removal action or the RI processes

3 REFERENCES

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United States Environmental Protection Agency 1989 Office of Emergency and Remedial Response Risk Assessment Guidance for Superfund Volume 1 – Human Health Evaluation Manual (Part A) Interim Publication 540/1 89/002 December

_______ 1990 National Oil and Hazardous Substances Pollution Contingency Plan Final Rule 40 CFR Part 300

_______ 1991a Office of Emergency and Remedial Response Risk Assessment Guidance for Superfund Volume 1 – Human Health Evaluation Manual (Part B Development of Risk based Preliminary Remediation Goals) Interim Publication 9285 7 01B October

_______ 1991b Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions Memorandum from USEPA Assistant Administrator Don R Clay April 22

_______ 1992 Supplemental Guidance to RAGS Calculating the Concentration Term Memorandum from Larry G Reed Director of Hazardous Waste Site Evaluation Division OERR 9285 7 081 June 22

_______ 1994 Guidance Manual for the Integrated Exposure Uptake Biokinetic Model for Lead in Children EPA/540/R 93/081 February

_______ 1996a Region IX Preliminary Remediation Goals (PRGs) Table – August 1

_______ 1996b USEPA Region IX Internal Memo Regarding Adult Lead Cleanup Goal from Daniel Stralka to Lewis Mitani August 8

_______ 1996c Recommendations of the Technical Review Workgroup for Lead for a Interim Approach to Assuming Risks Associated with Adult Exposures to Lead in Soil Technical Review Workgroup for Lead December

_______ 1997 Ecological Risk Assessment Guidance for Superfund Process for Designing and Conducting Ecological Risk Assessments EPA 540 R 97 006 June

4425-165644

Camp Covington

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco CA 94105

April 17 1998

MEMORANDUM

SUBJECT Draft Work Plan and Sampling and Analysis Plan for a Site Investigation of an Abandoned Pipeline Site Tenjo Vista Guam Mariana Islands Document Control Number [DCN] not available) BDGU002W98USF1 + BDGU003S98USF1

FROM Joe Eidelberg Chemist
Quality Assurance Program PMD-3

THROUGH Vance S Fong P E Manager
Quality Assurance Program PMD-3

TO Mike Wolfram Remedial Project Manager
Army & Pacific Islands Section SFD-8-3

Draft Work Plan (WP) and Sampling and Analysis Plan (SAP) for a site inspection (SI) of an abandoned pipeline site prepared by Earth Tech Inc for the Department of the Navy and dated March 1998 were reviewed The SAP is composed of two sections a field sampling plan (FSP) and a quality assurance project plan (QAPP) The review was based on guidance provided in Preparation of a U S EPA Region 9 Field Sampling Plan for Private and State-Lead Superfund Projects (August 1993 9QA-06-93) EPA Requirements for Quality Assurance Project Plans for Environmental Data Operations (EPA QA/R-5) and Guidance for the Data Quality Objectives Process (EPA QA/G-4)

The WP and SAP include most of the required elements for field sampling However some concerns have been noted during the review For example location maps do not identify all sampling locations tolerable limits on decision error have not been specified in the discussion on data quality objective (DQOs) and standard operating procedures (SOPs) are referenced for routine procedures but are not included with the documents The document is not consistent on how the laboratory should use project quality control (QC) criteria In addition no quality assurance manager (QAM) is identified for the project

The QA Program believes that the WP and SAP should address the following concerns prior to receiving EPA concurrence

Major Concerns

1 [**WP** Sections 4 Site Inspection Rationale 4 1 6 Excavate Trenches and Collect Subsurface Soil Samples Along Pipeline 4 2 6 Step 6 Specify Limits of Detection Error] Section 4 2 6 states that limits of decision error for the project cannot be defined because no previous information is available on contaminant concentration levels at the site Setting quantitative limits of decision error should be part of the planning process and used to aid the decision makers in choosing the number of samples that will need to be collected to meet the project objectives As no further action may be taken following this investigation it is recommended that the WP include quantitative acceptable decision error rates based on the consequences of making an incorrect decision Further limited information is provided in the WP on the rationale for the chosen number of samples It is suggested the WP discuss how the number of samples chosen will provide an acceptable level of confidence in the results

2A [**SAP** Sections 2 1 3 Field Sampling Program 2 1 10 Survey of Site and Sampling Locations Figure 2-1 Pipeline and Activity Location Map Table 3-1 Summary of Sample Collection Program **WP** Sections 4 1 Technical Approach 4 1 5 Collect Surface Soil Samples in Low-Lying Areas Figure 4-1 Pipeline and Activity Location Map] Sections 2 1 3 of the SAP and 4 1 of the WP state that the proposed sampling locations are identified in Figures 2-1 and 4-1 respectively Figures 2-1 (SAP) and 4-1 (WP) are the same figure Only the monitoring wells (groundwater sampling) and two of twelve trenches (sub-surface soil sampling) are indicated on the figures The location of the proposed five surface soil samples and the other ten trenches (Table 3-1) are not identified It is recommended that all sampling locations be identified on the figure It is further recommended that all sampling points should be identified on a location map of the area (such as Figure 1-1 of the SAP) rather than a schematic map so that they will be easy to locate by field personnel

2B Section 2 1 10 of the SAP describes how the sampling locations will be documented after all sampling is complete However Region 9 also requires that a FSP describe how sampling points will be selected in the field For example in the absence of a location map how will the field crew locate the proposed sampling points It is recommended that this information be included in the SAP

3 [**SAP** Section 3 3 2 6 Laboratory Quality Control Table 3-4 Project Quality Control Criteria] Section 3 3 2 6 of the SAP states that in the absence of laboratory specific

acceptance criteria the QC criteria in Table 3-4 will be used to validate data If the QC criteria in Table 3-4 are the specific QC criteria for the project then the laboratory chosen to perform the analyses should be able to achieve these limits (or more stringent if the laboratory routinely uses tighter limits) Similarly with Sections 3 4 2 3 (Matrix Spikes) and 3 4 2 4 (Duplicates) the laboratory chosen should be able to achieve project QC criteria described in Table 3-4 (Note Section 3 3 2 2 Target Detection Limits states the laboratory will be required to meet minimum detection limits)

Concerns

1 [**WP** Section 4 1 6 Excavate Trenches and Collect Subsurface Soil Samples Along Pipeline] Section 4 1 6 of the WP states grab samples will be collected from each trench but does not state how many will be collected for compositing It is recommended the plan indicate how many grab samples will be composited for each trench sample

2A [**SAP** Section 2 1 Description of Field Sampling and Testing Program] Section 2 1 of the SAP describes the proposed field sampling for the SI In many cases however specific step-by-step procedures for sample collection are not provided rather SOPs are referenced A field sample plan (FSP) should provide step- by-step procedures for samplers to follow or alternatively any appropriate SOPs to be used must be included with the plan

2B It should also be noted that Section 4 1 8 of the WP (Install Develop and Sample Groundwater Monitoring Wells) indicates that details on well construction and materials and groundwater sampling are included in the SAP Once again SOPs are referenced in the SAP but specific procedures are not included

2C Region 9 requires that when wells are being constructed for sample collection a description of design and construction details should be included In addition a table of well specifications such as well depths and casing diameters should be included in a FSP It is recommended that this information be included in the SAP

3 [**SAP** Section 2 3 2 Contractor Sample ID Number Table 2-5 QC Identifiers] Section 2 3 2 describes how samples will be labeled in the field It is suggested however that the QC identifiers described in Table 2-5 may not be blind to a laboratory if submitted for example as D for duplicate as noted in Table 2-5

4A [**SAP** Section 3 1 2 Project Organization] Section 3 1 2 of the SAP includes a table listing the project members No QAM is included in the table It is recommended the SAP include information on the project s QAM by identifying the QAM their level of authority lines of communication with management and independence from the entities producing data It is further recommended that an organization chart depicting all project personnel be included

4B It appears from the organization provided that the list includes Earth Tech Inc personnel only It is therefore recommended that a QAM who is a government employee (Navy) also be identified in the SAP

5 [**SAP** Sections 3 3 2 Laboratory Measurements 3 3 2 4 Calibration Procedures 3 3 2 5 Preventative Maintenance 3 3 2 6 Laboratory Quality Control 3 7 1 Laboratory System Audits] Limited information is provided on the proposed laboratory which will perform the analysis In fact it is unclear if more than one laboratory will be involved because Section 3 3 2 4 opens with the laboratories while Sections 3 3 2 5 and 3 3 2 6 open with the laboratory It is also unclear if a laboratory (or laboratories) has been chosen for the project at the time of writing this SAP Section 3 3 2 indicates a laboratory has not yet been chosen while Sections 3 3 2 5 and 3 7 1 seem to indicate a laboratory has already been selected If a laboratory (or laboratories) has been selected it is suggested it be identified

6 [General] The SAP includes most of the QAPP elements required by EPA QA/R-5 However the following lists some that have not been included

6A Approval sheet including the names titles signatures of appropriate approving officials and their approval dates

6B Distribution list of the individuals and their organizations who will receive the document and

6C The QAPP discusses data deliverables in hard copy and electronic format (Sections 3 4 5 3 6 1 and 3 6 3) However Region 9 also requires that a provision should be made for obtaining gas chromatography (GC) and gas chromatography/mass spectrometry (GC/MS) data on magnetic tape This should be made available to the Department of the Navy and to Region 9 upon request

Comments

1 [General] The pagination is incorrect in both the WP and the SAP text and table of contents

2 [**WP** Section 4 2 4 Step 4 Study Boundaries Table 6-1 Site Inspection Draft Schedule **SAP** Sections 2 1 Description of Field Sampling and Testing 3 5 Data Quality Assessment-Comparability] Section 4 2 4 and Table 6-1 of the WP and Section 2 1 of the SAP indicate that multiple sampling is not proposed for the project While Section 3 5 of the SAP speaks of both sampling events Presumably this is an error and should be corrected

3 [**SAP** Sections 2 1 11 Equipment and Personnel Decontamination 4 References] Section 2 1 11 cites a Health and Safety Management Plan It is suggested this be referenced in Section 4

4 [**SAP** Table 3-4 Quality Control Criteria] The units for volatile organic compounds (VOCs) have been omitted from the table

Questions or comments regarding this review should be referred to Joe Eidelberg EPA at (415) 744-1527 Technical assistance for this review was provided by Deirdre O Leary Lockheed Martin Environmental Services Assistance Team (ESAT) Contract No 68D60005 Work Assignment (WA) No 09-98-2-5 Technical Direction Form (TDF) No 9825007

4425-165644

June 4 1998

Camp Covington

MEMORANDUM

SUBJECT Draft Work Plan and Draft Sampling and Analysis Plan for the Abbreviated Remedial Investigation New Apra Heights Disposal Area COMNAVMARIANAS Guam (EPA QA Program Document Control Numbers [DCNs] BDGU006W98VSF1 and BDGU007S98VSF1)

FROM Joe Eidelberg Chemist
Quality Assurance Program PMD-3

THROUGH Vance S Fong P E Manager
Quality Assurance Program PMD-3

TO Mike Wolfram Remedial Project Manager
Army and Pacific Islands Section SFD-8-3

The subject draft work plan (WP) and draft sampling and analysis plan (SAP) prepared for the Department of the Navy by Earth Tech Inc and dated April 1998 were reviewed The review was based on guidance provided in EPA Requirements for Quality Assurance Project Plans for Environmental Data Operations August 1994 (EPA QA/R-5) Preparation of a U S EPA Region 9 Field Sampling Plan for Private and State-Lead Superfund Projects August 1993 (9QA-06-93) and Guidance for the Data Quality Objectives Process September 1994 (EPA QA/G-4)

The WP provides information regarding project history site description site evaluation data quality objectives (DQOs) remedial investigation (RI) tasks project schedule and an appendix which addresses human health and ecological preliminary risk assessment The SAP consists of two parts Part 1 is a field sampling plan (FSP) and Part 2 is a quality assurance project plan (QAPP) The SAP includes most of the FSP and QAPP elements required by Regional and Agency guidance However some elements require additional information and clarification while some elements have not been addressed These issues and some discrepancies are identified in the following itemized concerns

The subject SAP and WP cannot be approved by the Region 9 QA Program until the following concerns are addressed

Major Concerns

1 [FSP Section 2 3 2 Passive Soil Gas Survey Procedure] Section 2 3 2 states that soil gas probes will be installed and operated according to the manufacturer s recommendations and that the supplier of the gas probes will assist with the documentation needed for shipping the probes off-island and will analyze the soil gas probes The

supplier should be identified and the documentation described The discussion concerning soil gas probes in the SAP should be expanded to describe the collection and analysis of soil gas samples the principle behind the probes description of the technique sample packaging requirements holding times detection limits and quality control (QC) requirements and criteria If the soil gas samples will be sent to a different laboratory than the soil samples this should be discussed in the plan The laboratory QA plan should be provided for review

2 [FSP Section 2 5 2 Procedure Surface Soil Sampling Table 5-1 Containers and Preservatives QAPP Table 2-2 Requirements for Sample Preservation] Table 5-1 of the FSP and Table 2-2 of the QAPP indicate that glass jars will be utilized for soil samples collected for VOCs analysis while Section 2 5 2 of the FSP states that liners from core barrels will be used as sample containers It is recommended that the liners from core barrels be used as sample containers to avoid the potential loss of VOCs while transferring the sample to a glass jar This discrepancy must be addressed before sampling activities begin

3 [QAPP Section 1 3 Project Organization Figure 1-2 Project Organization Chart] The organization chart does not include any QA positions The chart should depict the QA manager and illustrate the QA manager s relationships with other project personnel The organization chart must also identify the Navy QA manager Section 1 3 should be revised and expanded to include descriptions of project and oversight personnel responsibilities Section 1 3 mentions a QA/QC reviewer however this position is not identified in the organization chart

4A [QAPP Table 3-1 Project Quality Control Criteria] Table 3-1 does not specify precision or accuracy criteria for many analytes A footnote for the missing criteria states standard not established The QAPP is the appropriate document to establish these limits based on project needs

4B Table 3-1 indicates that soil gas will be analyzed by SW846 8260 and 8270 not 8021 as indicated in other locations of the WP and SAP It is not clear whether the detection limits specified for soil gas volatile compounds are for method 8021 or 8260 This issue must be resolved

Concerns

1 [General] The SAP and WP reference standard operating procedures (SOPs) for a number of sampling activities

Since complete descriptions for a number of tasks (e g soil gas sampling) are provided in SOPs with little or no detailed information provided in the SAP the SOPs must be included with the final revision of the SAP

2A [WP Table 3-1 Chemicals of Potential Concern] Table 3-1 lists concentration ranges of chemicals of potential concern (COPCs) Results for volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs) are presented in ug/L units appropriate to liquid samples Results for total petroleum hydrocarbons (TPH) metals pesticides and explosives are presented in mg/kg or ug/kg This inconsistency should be corrected or explained

2B A footnote to Table 3-1 indicates that the results for VOCs and SVOCs are to be considered estimates because the reported value was less than the contract required detection limit (CRDL) Note that these concentrations are as high as 16 000 ug/L for VOCs and 270 000 ug/L for SVOCs It is recommended that the table indicate whether the results are total VOCs and SVOCs (summed) or provide the results for individual compounds

3 [FSP Table 3-1 Analytical Methods] Table 3-1 should specify whether soil samples will be analyzed for extractable or purgeable total petroleum hydrocarbons (TPH)

4 [FSP Section 5 3 5 Health and Safety] Section 5 3 5 states that for complete details concerning health and safety the Health and Safety Plan (HSP) is provided in an appendix to the SAP The HSP is not attached to SAP and is not identified in the table of contents The HSP must be included with the SAP in the field

5 [QAPP Section 2 2 1 Field Replicates FSP Table 3-3 Sampling and Analysis Plan Summary Table 4-2 QC Designator Types] Although Section 2 2 1 of the QAPP states that replicate samples collected for volatiles will not be homogenized it is not clear from Tables 3-3 and 4-2 of the FSP that this is the case Table 3-3 of the FSP indicates that field replicates will be collected for VOC samples and Table 4-2 defines a *replicate* as an homogenized sample (as opposed to *duplicate* which is defined as a collocated sample in Table 4-2) The FSP tables should be revised to indicate that replicate (or duplicate) samples collected for VOC analysis will not be homogenized

6 [QAPP Section 5 Data Quality Assessment] The QAPP should describe how the results will be reconciled with the results of the DQO process established in the WP

7 [QAPP Section 6 Data Management] Section 6 states the required turn around time for data packages It is not clear whether this information applies to soil gas analyses It is recommended that Section 6 be revised to address soil gas analyses

8A [QAPP Section 6 1 Receipt of Deliverables] Section 6 1 refers to a project chemist The affiliation of this position e g whether this is a laboratory or Earth Tech position is not clear A project chemist is not identified in the organization chart or related text

8B Section 6 1 should include a specification that the gas chromatography/mass spectrometry (GC/MS) tapes will be submitted with the project data and will be available to EPA upon request

9 [QAPP Section 7 Audits and Corrective Actions FSP Section 2 9 Site-Specific Field QA/QC Requirements Table 4-2 QC Designator Types] Section 7 of the QAPP should be revised to describe the use of double-blind performance evaluation (PE) samples for laboratory evaluation Note that Table 4-2 of the FSP specifies the QC designator X for PE samples and that Section 2 9 of the FSP cites the QAPP for details of QA/QC requirements

10 [QAPP General] The following elements are required by the current guidance document QA/R-5 According to QA/R-5 if an element is not considered appropriate to the project this should be stated and a reason provided

10A Names titles and signatures of approving officials and approval dates

10B A distribution list of persons and organizations who will receive copies of the approved document

10C Special training requirements/certification The QAPP should indicate whether special training or certification is required to perform tasks required for the project

Questions or comments regarding this review should be referred to Joe Eidelberg EPA QA Program at (415) 744-1527 Technical assistance for this review was provided by Doug Lindelof Lockheed-Martin Environmental Services Assistance Team (ESAT) Contract No 68D60005 Work Assignment (WA) No 9-98-2-5 Technical Direction Form (TDF) No 9825019